SERVICE

1A2 KEY TELEPHONE SYSTEM

620A, 641A, AND 642A MODULAR PANELS

CONTENTS PAGE

1. GENERAL

1.01 This section contains identification, installation, connection, and maintenance information for the 620A, 620A2, 641A, and 642A modular panels (Fig. 1, 2, 3, and 4) and associated power units (Fig. 6).

1.02 This section is reissued to:

- Add information on the treatment of central office (CO) lines under the Federal Communications Commission's (FCC) registration program
- Add information on the 620A2 panel, 198A backboard, and 16A1-160 terminal block
- Rate the 620A panel MD
- Add connections for 421A KTU (Audible Signal Suppression Circuit), 451B KTU (Music-On-Hold Circuit), and 494A KTU (TOUCH-TONE® Selector Circuit)
- Add information on the 467A KTU (Low Voltage Monitor)
- Provide new Table C.

1.03 This issue of the section is based on the following drawings:

- SD-69658-01, Issue ▶5◀ —Modular Panels, 620A, 620A2, 626A, 641A, and 642A
- SD-82227-01, Issue 1—Power Unit, 79B1
- SD-82227-02, Issue 2—Power Unit, 79B2
- SD-82198-01, Issue ▶3◀ —Power Unit, 90B1

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of changes and the manner in which the section may be affected.

1.04 ▶Incoming CO lines to be installed in compliance with the FCC registration program must be routed through a standard network interface. Information on approved interfaces is contained in Section 461-604-105, entitled Connecting Blocks, 66M3-50R—Identification, Installation and Maintenance.◀

2. IDENTIFICATION

2.01 The 600-series modular panels make installation easier, minimize connections, and reduce mounting and terminal space requirements.

2.02 These panels provide standard 1A2 KTS features and accommodate the 1A2 KTUs listed in Table A.

ORDERING GUIDE

2.03 This section covers the three initial modular panels coded as follows:

- Panel, Modular 620A (MD) or 620A2 (Line Services)
- Panel, Modular, 641A (Dial Intercom)
- Panel, Modular, 642A (Miscellaneous)

▶Information on the 626A panel which provides button-per-path intercom can be found in Section 518-215-421.◀

Note: The 620A, 620A2, and 642A panels are equipped with 834055907 (P-40V590) guide assemblies.

(a) ***Replaceable Components (see Table B)***

(b) ***Associated Apparatus (order separately)***

- ➧Unit, Telephone, Key—order as required from Table A

- Unit, Power—refer to Table C for selection

- Block, Connecting, 92A—interconnects one 620A, 620A2, 641A, or 642A modular panel to a 19-, 20-, 29-, or 30-type power unit

- Cord, Power

  824013262 (P-40J326)—1-1/2 feet

  824013270 (P-40J327)—2 feet

  824013288 (P-40J328)—4 feet

  824013296 (P-40J329)—6 feet

  824010995 (P-40J099)—12 feet

- Cord, P12D—power interconnect cable extender

- Insulator, Terminal, C Clip—for insulating RN terminals on all panels and 105V terminals on 641A panel.➧

(c) ***Optional Apparatus (order separately; see Table D)***

◆ TABLE A ◆

600-SERIES MODULAR PANEL AND KTU
SELECTION AND CONNECTION FIGURE INDEX

KTU	SIZE		CIRCUIT FUNCTION	MODULAR PANEL			TEST	CONNECTION FIGURE (SEE NOTE)
	INCHES	PINS		620A/A2	641A	642A		
400B, C, D	4	18	CO/PBX Line	●			A	14
400G	4	18	CO/PBX Line	●			A	15
400H	4	18	CO/PBX Line	●			A	16
401A, B	4	18	Manual Intercom	●			B	17
407B, C	8	80	Dial Intercom, 10-Code		●		I	27 thru 34
413A	4	18	Auxiliary Ringup	●				18
414A	4	20	Manual Signaling, Ringdown, Private Line	●			C	19
415A	4	18	Automatic, DC Signaling, Ringdown, Private Line	●			D	20
416A	4	20	Station Line	●			E	21
417A	4	40	Add-On Conference			●	L	36
418A	4	20	Short Range, DC Signaling, Private Line			●	M	37
419A	8	80	Automatic Signaling, Ringdown, Private Line	●			F	22
420A	4	18	Long Line			●	K	33
421A	4	40	Power Failure Transfer			●		38
			Direct Station Selection			●		34
			Audible Signal Suppression			●		39
422B	4	40	Station Busy Selector			●		31, 32
424A, B, C	8	80	Dial Intercom, 19-Code		●		I	27 thru 34
425A, B	8	80	Dial Intercom, Flashing Lamp		*	●		29,30,31,32
428A	4	40	Multiline Exclusion			●		40

◆TABLE A◆ (Contd)

600-SERIES MODULAR PANEL AND KTU
SELECTION AND CONNECTION FIGURE INDEX

KTU	SIZE		CIRCUIT FUNCTION	MODULAR PANEL			TEST	CONNECTION FIGURE (SEE NOTE)
	INCHES	PINS		620A/A2	641A	642A		
429A, B	4	40	Supplementary Hold Detector			●		41
430A	4	20	Flutter Generator			●		41
440A	8	80	TOUCH-TONE Adapter		*	●		27,29,30,32
448A	4	40	Variable Delay Timer			●		42
449A	4	40	Immediate Transfer Control			●		43
451B‡	4	40	Music-On-Hold			●	N	44
461A	4	18	Manual Signaling, Ringdown, Private Line	●			C	19
467A	4	18	Low Voltage Monitor	●		●		
469A	4	18	Lamp Extender	●			G	23
471A, B	4	18	Battery Reversal Toll Restriction	●			H	24
476†	4	20	Dial Tone, Station Busy Tone, and Audible Ringback Tone			●		30, 31, 32
478B	8	80	TOUCH-TONE Adapter		*	●		27,29,30,32
479A	8	80	Rotary Dial Toll Restriction			●		45
494A	8	80	TOUCH-TONE Selector Circuit		●		J	28
498A‡	4	40	Music-On-Hold			●	N	46

Note: Connection figures are designed for current model KTUs but are applicable for all codes indicated in this table.

* If 425A or B KTU is used in 641A panel, the 440A or 478B KTU must go in a 642A panel.

† 476A KTU replaces 423B (MD). Do not use 423A KTU in modular panels.

‡ The 451B KTU supplies music-on-hold for seven circuits. The 498A KTU contains four circuits and can be increased to seven by the addition of a 116A1 circuit module to the KTU.

TABLE B

REPLACEABLE COMPONENTS

UNIT	DESCRIPTION			IDENTIFICATION CODE
Modular Panel	Lamp		10V	51A
	Indicator, Fuse		White	KS-14174, L1
			Brown	KS-14174, L8
	Fuse		1-1/3 amp	70A
			3/4 amp	70H
Power Unit	Fuse	Input	2 amp*	BUSSMAN MDL-2
			5 amp	BUSSMAN MDX-5
		Output	2 amp	24C
			3 amp	24B
			5 amp	24F
	Interrupter		10V	KS-19175, L3

* 79B2 only.

◆TABLE C◆

POWER UNIT CAPACITIES

POWER UNIT	CAPACITY
79B1	Maximum three 620A or 620A2 panels or two 620A or 620A2 panels plus any combination of two 641A or 642A panels or any combination of four 641A or 642A panels plus four 66B4-25 connecting blocks or four 16A1-160 terminal blocks
79B2	Maximum of four 620A, 620A2, 641A, or 642A panels in any combination plus four 66B4-25 connecting blocks or four 16A1-160 terminal blocks
90B1	Maximum of ten 620A, 620A2, 641A, or 642A panels in any combination plus sixteen 66B4-25 connecting blocks or sixteen 16A1-160 terminal blocks
19-, 20-, 29-, or 30-type	One or two 620A, 620A2, 641A, or 642A panels where interrupted power is not required or can be obtained from 584C panel or 232-type KTU.

♦TABLE D♦

OPTIONAL APPARATUS (ORDER SEPARATELY)

DESCRIPTION		IDENTIFICATION CODE
Adapter, Plug, Power Cord		HUBBELL BL-12433
Adapter, Bridging, Quick-Connect	Horizontal	183A2
	Vertical	183B2
Block, Matrix		1A1
Backboards	Green	183A2*
	Blue	183B1*
	Red	184A1, B1†, B2†
	Yellow	185A1
	White	187B1
	White	198A
Block, Connecting		66B4-25
		66B3-50
		66M1-50
Block, Terminal		16A1-160
Cord (Power Interconnect Cord Extender)	8 ft. ‡	P12D
Cover	For 620A or 620A2	151A
	For 641A or 642A	152A
Cover (End Cap)		153A
Tag, Ground		E3013B
Trough, Wiring (with Cover)		840348288

* Equipped with 89B brackets.

† Equipped with four 66B4-25 connecting blocks.

‡ 8 ft. is standard length. Available in other lengths if specified on order.

DESIGN FEATURES

A. Common Features

2.04 The 600-series modular panels share the following features:

- Accommodate 400-series KTUs providing services described in Table A.
- 66-type quick-connect terminal field.
- Steady and interrupted power (Table F) provided by an external power source via factory-wired, 12-conductor, 42-inch power cable. Extender cords are available and must be ordered separately. (See Table D.)
- Retainer and guide assembly serve to lock KTUs in connectors (Fig. 1).
- Dimensions: same height and depth; 620A twice as wide as 641A or 642A (see Table E).
- Built-in lamp and fuse block assembly (Fig. 5) with self-indicating fuses and lamps which offer visual indications of the status of a related circuit.

B. 620A (MD) Modular Panel

- Provide line and auxiliary services (maximum 8) as listed in Table A.
- 913B connectors accommodate eight 4-inch KTUs.
- Two terminal fields (red) divided into quadrants and wired to similarly positioned connectors (see Fig. 2) which offer KTU services independent of each other.
- Lamp load not to exceed 100 lamps per panel (60 if 79B1 power unit is used) or 20 lamps per line circuit. Lamp loads in excess of the above require the use of lamp extenders (469A KTU).

C. ◆620A2 Modular Panel (Fig. 1 and 2)

Identical to 620A except:

- Has rigid printed wiring board backplane.
- Fourth fuse (10 Vac) added at top of panel.
- Appearance of 10 Vac added to all eight quadrants of terminal field—24 Vdc added to quadrant 1A only. Provides access to buzzer voltages when using manual intercom circuit (401A KTU).◆

D. 641A Modular Panel (Fig. 3)

- Provides 10- and 19-code dial intercom services (Tables A, G, and H).
- Optionally accommodates either flashing lamp circuit (425B KTU) or TOUCH-TONE adapter (440A or 478B KTU).
- Four 914B connectors are vertically paired to accommodate two 8-inch KTUs.
- Terminal field (yellow) utilized by all connectors for a common dial intercom service (***NOT*** related to individual connectors by quadrants as on the 620A (MD), 620A2, and 642A panel).
- Built-in lamp and fuse block assembly equipped with fuses in positions 1A and 1B, and a lamp in position 1A (remaining fuse and lamp positions unequipped) (Fig. 5).
- Provides station cross-connect field and option terminal field with designated areas TT (TOUCH-TONE), POWER, LAMP FLASH, and OPTIONS.

E. 642A Modular Panel (Fig. 4)

- Provides miscellaneous KTU services (Table A).
- Four 40-pin 914B connectors accommodate four 4-inch KTUs or two 8-inch KTUs (through removal of guide assemblies).
- Terminal field (yellow) divided into quadrants and wired to similarly positioned connectors which offer KTU services independent of each other.

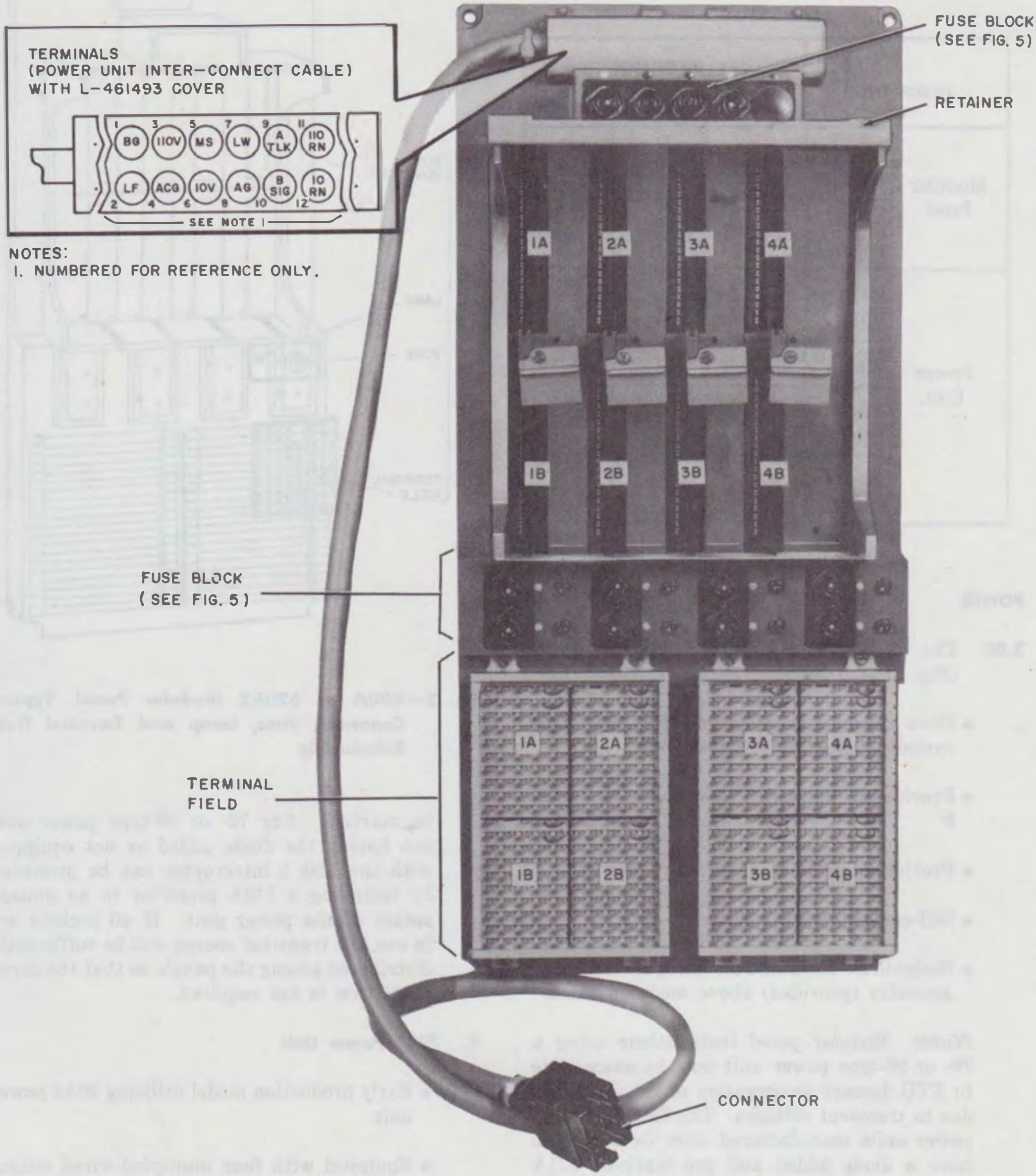


Fig. 1—620A2 Modular Panel

♦TABLE E♦

DIMENSIONS

DESCRIPTION		(IN INCHES) WIDTH	HEIGHT	DEPTH
Modular Panel	620A 620A2	8-1/2	18-3/8	5-3/4
	641A 642A	4-1/4	18-3/8	5-3/4
Power Unit	79B1 79B2	14-1/8	8-3/8	6-5/16
	90B1	16-1/8	9-1/4	6-5/16
	19-, 20-type	8-3/4	9-1/4	5
	29-, 30-type	14-1/8	18-3/8	6-3/8

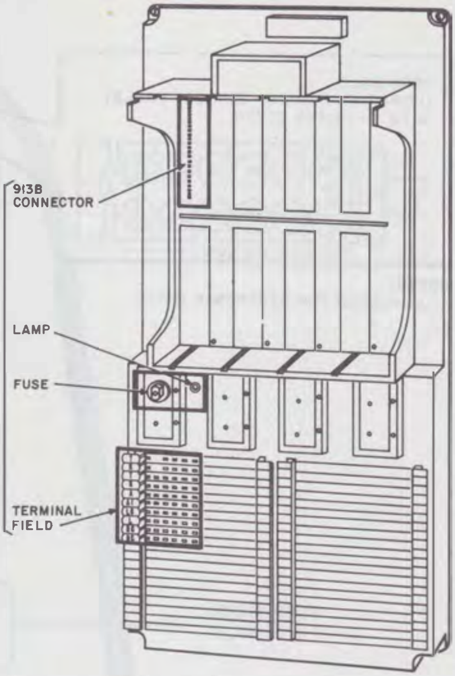


Fig. 2—620A or 620A2 Modular Panel, Typical Connector, Fuse, Lamp and Terminal Field Relationship

POWER

2.05 The 79B1, 79B2, and 90B1 power units (Fig. 6):

- Have capacity to serve modular panels in varied combinations (Table C)
- Provide all required KTS voltages per Table F
- Provide three ac voltage input taps
- Self-contained interrupter
- Designed for horizontal mounting on backboard assembly (provided) above modular panel.

Note: Modular panel installations using a 79- or 90-type power unit may be susceptible to KTU damage or operation of the -24B fuse due to transient voltages. The 79B2 and 90B1 power units manufactured after October 1975 have a diode added and are marked "521A Diode Added" on the insulator. Later versions of the 79B2 are manufactured with a KS-19175, List 5 interrupter and are marked "Protection Not Required." The 90B2 power unit will also be equipped with the List 5 and will also be marked. Any 79- or 90-type power unit not having the diode added or not equipped with the List 5 interrupter can be protected by installing a 140A protector in an unused socket of the power unit. If all sockets are in use, the transient energy will be sufficiently distributed among the panels so that the surge protection is not required.

A. 79B1 Power Unit

- Early production model utilizing 20A2 power unit
- Equipped with four multipled-wired output connectors
- Serves a maximum of three 620A or 620A2 panels, or two 620A or 620A2 panels plus ***any combination*** of two 641A or 642A

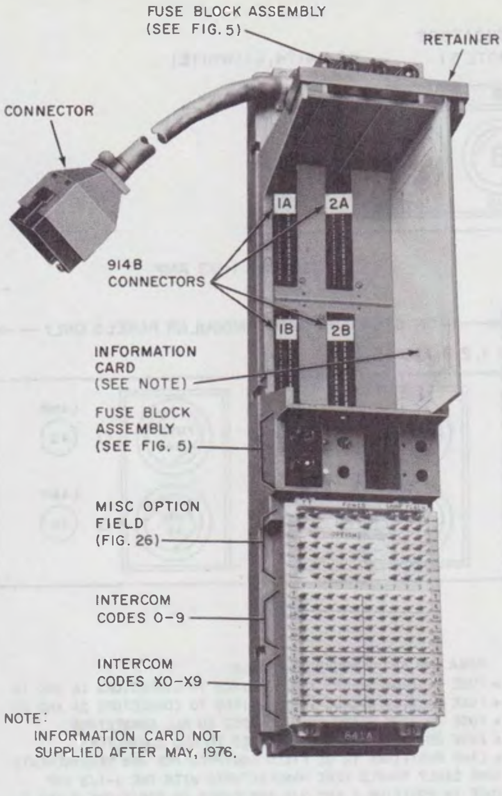


Fig. 3—641A Modular Panel

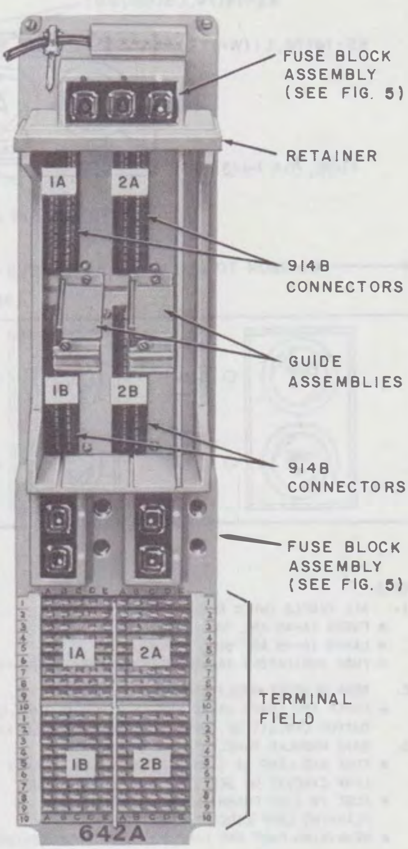


Fig. 4—642A Modular Panel

panel or ***any combination*** of four 641A or 642A panels; plus up to four 66B4-25 connecting blocks or four 16A1-160 terminal blocks if required for line multiples in excess of panel capacity.

B. 79B2 Power Unit

- Replacement for 79B1 model utilizing a 20A3 power unit and providing additional dc and lamp power

- Equipped with four multipled-wired output connectors

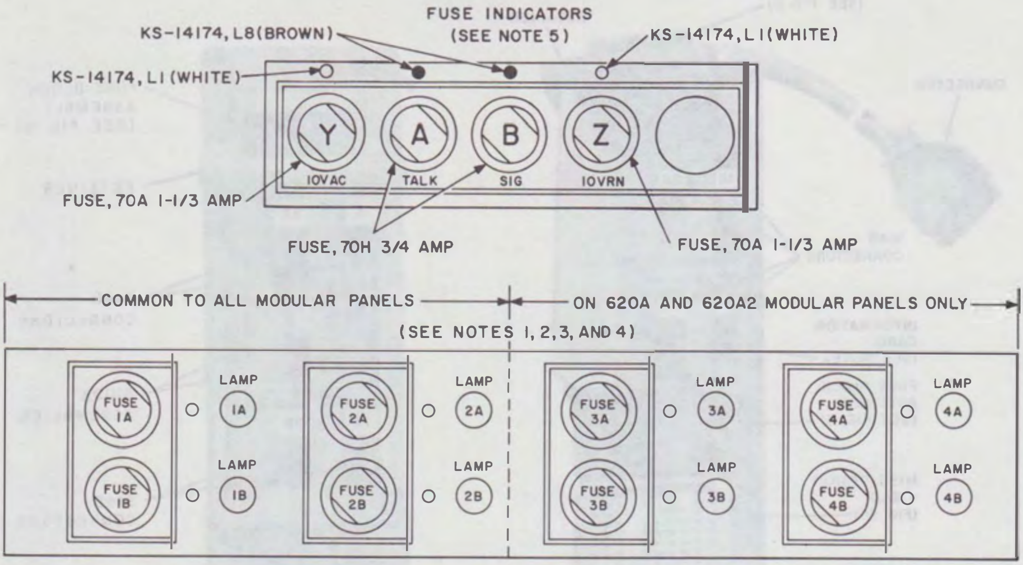
- Serves a maximum of four 620A, 620A2, 641A, or 642A panels ***in any combination*** plus four 66B4-25 connecting blocks of four 16A1-160 terminal blocks if required for line multiples in excess of panel capacity.

C. 90B1 Power Unit

- Utilizes a 30A1 power unit

- Equipped with ten multipled-wired output connectors

- Serves a maximum of ten 620A, 620A2, 641A, or 642A panels ***in any combination*** and up to sixteen 66B4-25 connecting blocks



NOTES:

1. ALL PANELS (WHEN REQUIRED):
   - FUSES 1A-4B ARE 70A, 1-1/3 AMP.
   - LAMPS 1A-4B ARE 51A, 10V AC.
   - FUSE INDICATORS 1A-4B ARE KS-14174, L1 (WHITE).
2. 620A OR 620A2 MODULAR PANEL:
   - FUSES AND LAMPS 1A-4B SERIES WIRED IN LINE LAMP OUTPUT CIRCUIT OF CONNECTORS 1A-4B RESPECTIVELY.
3. 641A MODULAR PANEL:
   - FUSE AND LAMP 1A (10V STEADY) WIRED TO BUSY LAMP CIRCUIT OF SELECTOR (407 OR 424 KTU)
   - FUSE 1B (10V FLASH) WIRED TO INPUT OF FLASHING LAMP CIRCUIT (425 KTU)
   - REMAINING FUSE AND LAMP POSITIONS NOT EQUIPPED
4. 642A AND 642AR MODULAR PANELS:
   - FUSE 1A (10V STEADY INPUT) WIRED TO CONNECTORS 1A AND 1B
   - FUSE 2A (10V STEADY INPUT) WIRED TO CONNECTORS 2A AND 2B
   - FUSE 1B (10V FLASH INPUT) WIRED TO ALL CONNECTORS
   - FUSE 2B (10V WINK INPUT) WIRED TO ALL CONNECTORS
   - LAMP POSITIONS TO BE FIELD EQUIPPED PER JOB REQUIREMENTS
5. SOME EARLY PANELS WERE MANUFACTURED WITH THE 1-1/3 AMP FUSE IN POSITION A AND 3/4 AMP FUSES IN POSITIONS B AND Z. THE KS-14174 INDICATORS SHOULD BE REARRANGED TO AGREE WITH FUSES. WHERE REQUIRED THE NECESSARY INDICATORS CAN BE ORDERED AS: D-180586 KIT OF PARTS

Fig. 5—♦Line Lamp and Fuse Block Assembly♦

or sixteen 16A1-160 terminal blocks if required for line multiples in excess of panel capacity.

D. 19-, 20-, 29-, or 30-Type Power Unit

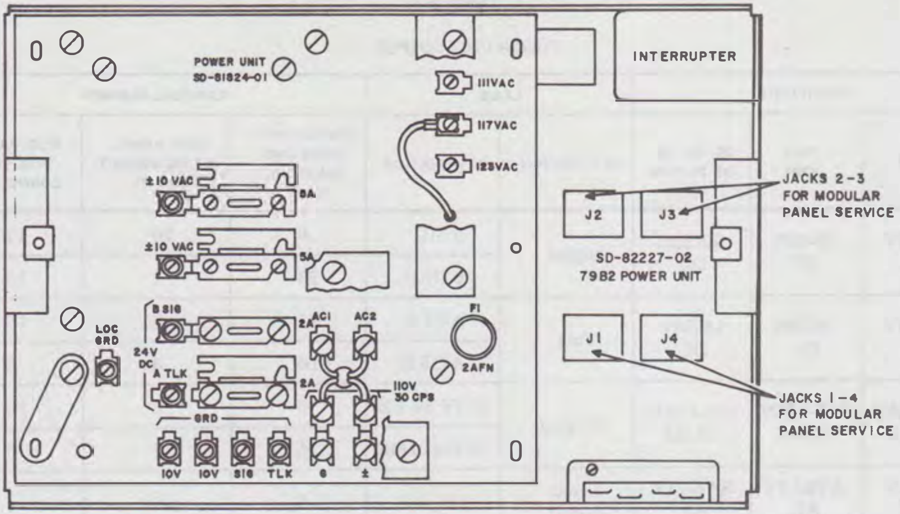
- Used at small installations for one or two panels where interrupted power is not required, or can be separately obtained from a 584C panel or 232-type KTU.
- Requires a 92A connecting block as interface between power unit and modular panel power connector.

3. INSTALLATION

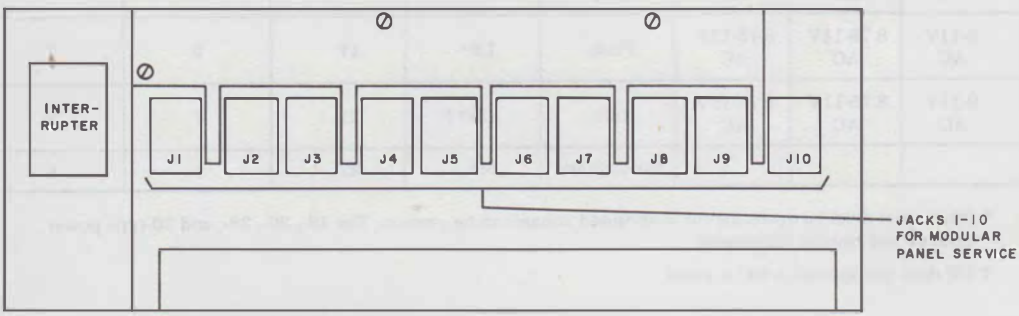
PLANNING

3.01 Select a wall location for a centralized key telephone installation in accordance with the following:

- Customer's approval and best interest
- Accessible with adequate illumination for maintenance
- Wall offering adequate support and stability



FRONT VIEW OF 79B2 POWER UNIT



BOTTOM VIEW OF 90B1 POWER UNIT

Fig. 6—Modular Panel Power Jacks on 79B1, 79B2, and 90B1 Power Units

- As close as practicable to stations being served
- Close to conduit or duct system for cabling purposes
- Near commercial ac power receptacle(s)
- Sufficient clearance above floor to avoid damage from water or blows incident to cleaning

TABLE F

POWER UNIT OUTPUT

POWER UNIT			LEAD		TERMINAL NUMBER		
79B1	79B2 90B1	19-, 20-, 29 OR 30-TYPE	DESCRIPTION	DESIGNATION	POWER UNIT JACKS AND 92A CONN. BLK.	MOD. PANEL INTERCONNECT (FIG. 1)	MOD. PANEL 913B/914B CONNECTOR
20-26V DC	20-26V DC	20-26V DC	Signal	B SIG	8	10	17
				B GRD	20	1	15
20-26V DC	18-26V DC	18-26V DC	Talk	A TLK	12	9	18
				A GRD	16	8	3
105-125V 30 HZ	105-125V 30 HZ	105-125V 30 HZ	Ringing	105V 30 HZ	9	3	10
				ACG and MG	24	4	6
9-11V AC	8.75-11V AC	8.75-11V AC	Lamp Supply	10V AC	4	6	4
105-125V 30 HZ	105-125V 30 HZ	105-125V 30 HZ	Interrupted Ring	105V RN*	1	11	
9-11V AC	8.75-11V AC	16-20V AC	Interrupted Buzz	10V RN*	19	12	
9-11V AC	8.75-11V AC	8.75-11V AC	Flash	LF*	17	2	7
9-11V AC	8.75-11V AC	8.75-11V AC	Wink	LW*†	21	7	2
			Motor Start	MS	22	5	5

* Interrupter must be operating for interrupted voltages to be present. The 19-, 20-, 29-, and 30-type power units do not have an interrupter.

† LW does not appear on 641A panel.

- Clean, dry, well-ventilated, and free from flammable or corrosive fumes
- Where the surrounding room temperature normally does not exceed 110°F. Avoid locations near radiators, steam pipes, registers, and similar heating devices which would subject the equipment to excessive heat.

3.02 Select appropriate modular panels and KTUs (Table A), backboards and connecting blocks (Table D), per job requirements.

3.03 Determine type and quantity of power units required. See POWER, paragraph 2.05, or Table C.

Note: Varied combinations of panels per power unit are desirable to more evenly balance power unit load; eg, on installations having more than one power unit, mix panel codes on any single power unit rather than having one power unit serve only 620A or 620A2 panels, and another to serve 641A or 642A panels.

3.04 A 19-, 20-, 29-, or 30-type power unit can be used to supply a small number of 641A or 642A panels, either in installations where the power unit is in place or in new installations as long as the output of the power unit is not exceeded and interrupted power (flash, wink, etc) is not required by the KTUs. A 92A connecting block is required to provide a receptacle for the panel power connector and terminals for the leads from the power unit. The lack of interrupted power restricts usage to the following KTUs:

- 641A panel—407- and 424-type, 440A, 478B or ◆494A◆ KTUs
- 642A panel—417A, 420A, 421A, 422B, 428A, 429A/B, 430A, 440A or 478B, 448A, 449A, 451B, 476A, 471A/B or 479B KTUs

If interrupted power can be obtained from an associated 584C panel or 232-type KTU, any KTUs that can be mounted in the panels per Table A (including the 620A or 620A2 panel) may be used.

3.05 Customer must provide adequate number of commercial ac receptacles to meet job requirements in accordance with the following:

- Not controlled by a switch.
- Separately fused if possible.
- Within access of power unit cord(s), preferably 6- to 7-feet high.
- AC receptacles must be 3-wire grounded type.

3.06 Refer to the following sections for additional information required to plan the installation of a key telephone system.

- 518-010-101—Centralized Key Telephone Installations
- 518-010-105—KTS, Grounding and Special Protection Requirements
- 518-215-100—1A2 KTS, Identification and Arrangements
- 518-215-400—Service, 1A2 KTS, Line Services
- 518-215-401—Service, 1A2 KTS, Auxiliary Line Services
- 518-215-402—Service, 1A2 KTS, Intercom Services
- 518-215-403—Service, 1A2 KTS, Control Services.

INSTALLING

3.07 Use care unpacking modular panels, power units and KTUs to prevent damage to them.

A. Centralized Installation

3.08 A preferred installation method is illustrated in Fig. 7. The 620A, 620A2, 641A, and 642A panels are to be mixed in any order with 184-type backboards in a single row directly above a WHITE and BLUE backboard field. Do not leave any space between adjacent panels unless stacking panels (see *Note*) or if covers and end panels are to be used (paragraph 3.09).

> *Note:* Some locations may be limited for space or otherwise will not allow this arrangement and will require stacking of panels one above the other. (See Stacking Panels, paragraph 3.10.)

3.09 A recommended sequence for mounting modular panels, backboards, and power units is as follows (see Fig. 7):

(1) Mount a 183A2 (GREEN) backboard in lower left corner, 1 foot above floor. Stack second GREEN backboard atop first. (See *Note*.)

> *Note:* When job requirements call for less than two BLUE or GREEN backboards, the lower backboard may be omitted and adequate space allowed for its addition as future growth demands.

(2) Place a 185A1 (YELLOW) backboard atop second GREEN backboard.

(3) Mount 183B1 (BLUE) backboards, stacked two high and butted next to GREEN backboards.

(4) Mount a 187B1 (WHITE) backboard atop each uppermost BLUE backboard, butting

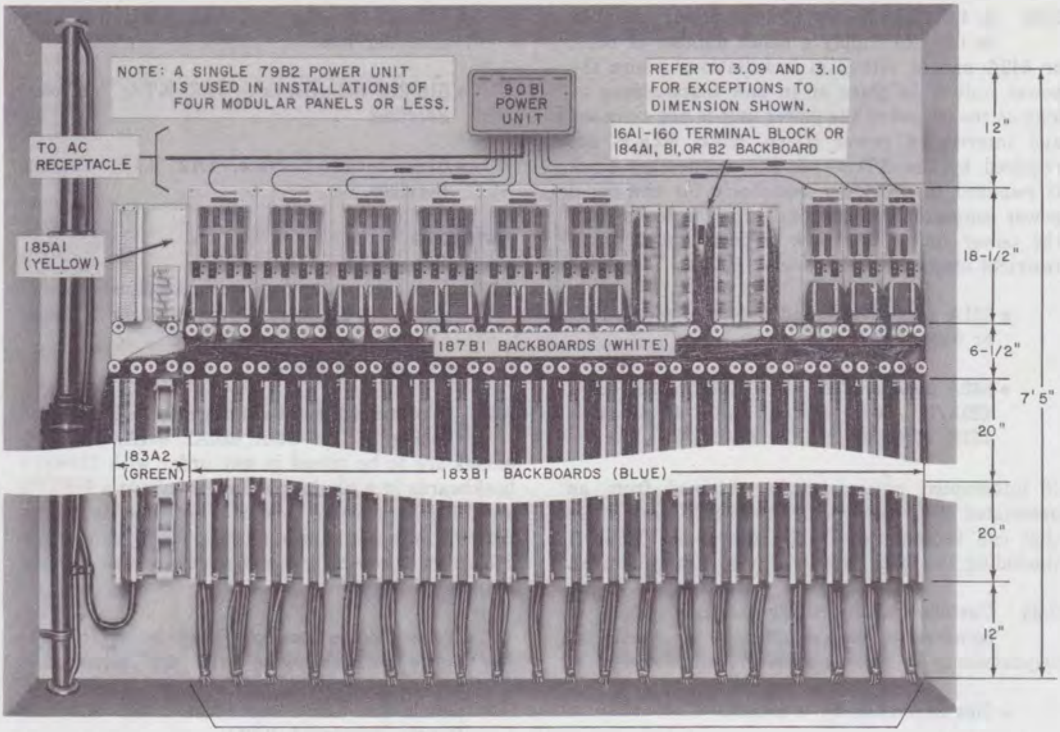


Fig. 7—♦Centralized Terminal Field, Typical Arrangement of Modular Apparatus♦

first against the side of the YELLOW backboard, and expanding from left to right. WHITE backboards must be installed to the widest point of either the RED (modular panel) or BLUE terminal field.

(5) Line, intercom, and miscellaneous panels, selected per job requirements, may be intermixed freely in the RED terminal field butting atop the WHITE backboards. First panel is placed above the extreme left BLUE backboard and the remaining panels suitably arranged and added in order from left to right. If covers are to be used on the panels, leave 1/2-inch space between the top of the WHITE backboards and the bottom of the panels and 1-inch space between adjacent panels. If wiring troughs are also used, allow 1/2 inch between top of panels and wiring trough. (A paper template is provided with each panel to facilitate mounting.)

♦*Note:* The 16A1-160 terminal blocks or 184A1, B1 or B2 (RED) backboards may also be intermixed with modular panels as desired to provide station terminations in excess of the panel terminal capacity (see Fig. 7 or 8). The 16A1-160 terminal block is the same height as the modular panels and half the width of a 620A panel. Two connecting blocks are provided which duplicate the designations and quadrants of a 620A panel. If required, the terminal blocks will accept 152A covers and 153A end caps.♦

(6) The 79B1, 79B2, and 90B1 power units are to be mounted above the cluster of modular panels they service with top of unit(s) 7 feet 5

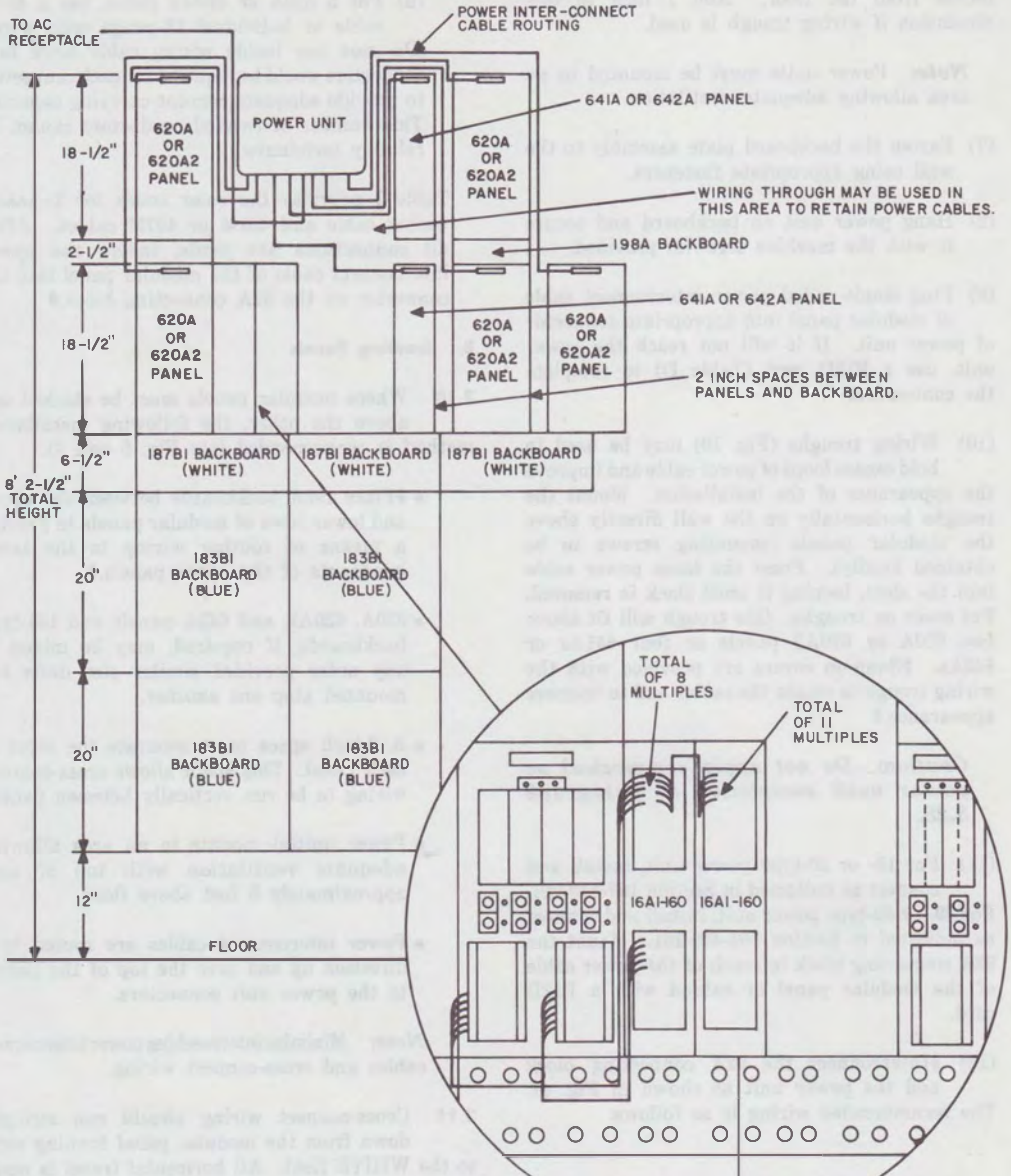


Fig. 8—▶Stacked Modular Apparatus and Method of Terminal Multipling Using 16A1-160 Terminal Blocks◀

inches from the floor. Add 1 inch to this dimension if wiring trough is used.

Note: Power units must be mounted in an area allowing adequate ventilation.

(7) Fasten the backboard plate assembly to the wall using appropriate fasteners.

(8) Hang power unit on backboard and secure it with the machine screw(s) provided.

(9) Plug single-ended power interconnect cable of modular panel into appropriate connector of power unit. If it will not reach the power unit, use a P12D cord (Table D) to complete the connection.

(10) Wiring troughs (Fig. 10) may be used to hold excess loops of power cable and improve the appearance of the installation. Mount the troughs horizontally on the wall directly above the modular panels (mounting screws to be obtained locally). Press the loose power cable into the slots, looping it until slack is removed. Put cover on troughs. One trough will fit above two 620A or 620A2 panels or four 641As or 642As. ➧Snap-on covers are provided with the wiring trough to retain the cables and to improve appearance.➧

Caution: Do not apply commerical ac power until completion of paragraph 3.28.

(11) For 19- or 20-type power unit, install and connect as indicated in Section 167-440-201. For 29- or 30-type power unit, install and connect as indicated in Section 167-446-101. Mount the 92A connecting block in reach of the power cable of the modular panel or extend with a P12D cord.

(12) ➧Interconnect the 92A connecting block and the power unit as shown in Fig. 47. The recommended wiring is as follows:

(a) For a 641A or 642A panel, use a 451M cable, a 12-pair D inside wiring cable, or individual 18-gauge solid wires. If a 12-pair inside wiring cable is used, each pair should be skinned, twisted together, and terminated as a single conductor.

(b) For a 620A or 620A2 panel, use a 457M cable or individual 18-gauge solid wires. ***Do not*** use inside wiring cable since four conductors would be required for each connection to provide adequate current-carrying capacity. This number of twisted conductors cannot be reliably terminated.

Table I provides the color codes for D inside wiring cable and 451M or 457M cables. After all connections are made, insert the power interconnect cable of the modular panel into the connector on the 92A connecting block.➧

B. Stacking Panels

3.10 Where modular panels must be stacked one above the other, the following installation method is recommended (see Fig. 8 and 9).

- ➧Place 198A backboards between the upper and lower rows of modular panels to provide a means of routing wiring to the inner quadrants of the upper panels.➧
- 620A, 620A2, and 642A panels and 184-type backboards, if required, may be mixed in any order provided similar size units are mounted atop one another.
- A 2-inch space must separate the sides of each panel. This space allows cross-connect wiring to be run vertically between panels.
- Power unit(s) mounts in an area allowing adequate ventilation with top of unit approximately 8 feet above floor.
- Power interconnect cables are routed in a direction up and over the top of the panels to the power unit connectors.

Note: Minimize intermeshing power interconnect cables and cross-connect wiring.

3.11 Cross-connect wiring should run straight down from the modular panel fanning strip to the WHITE field. All horizontal travel is made within the WHITE field.

C. Grounding and Protection

3.12 ***Grounding:*** To prevent damage to the telephone equipment, it is imperative that

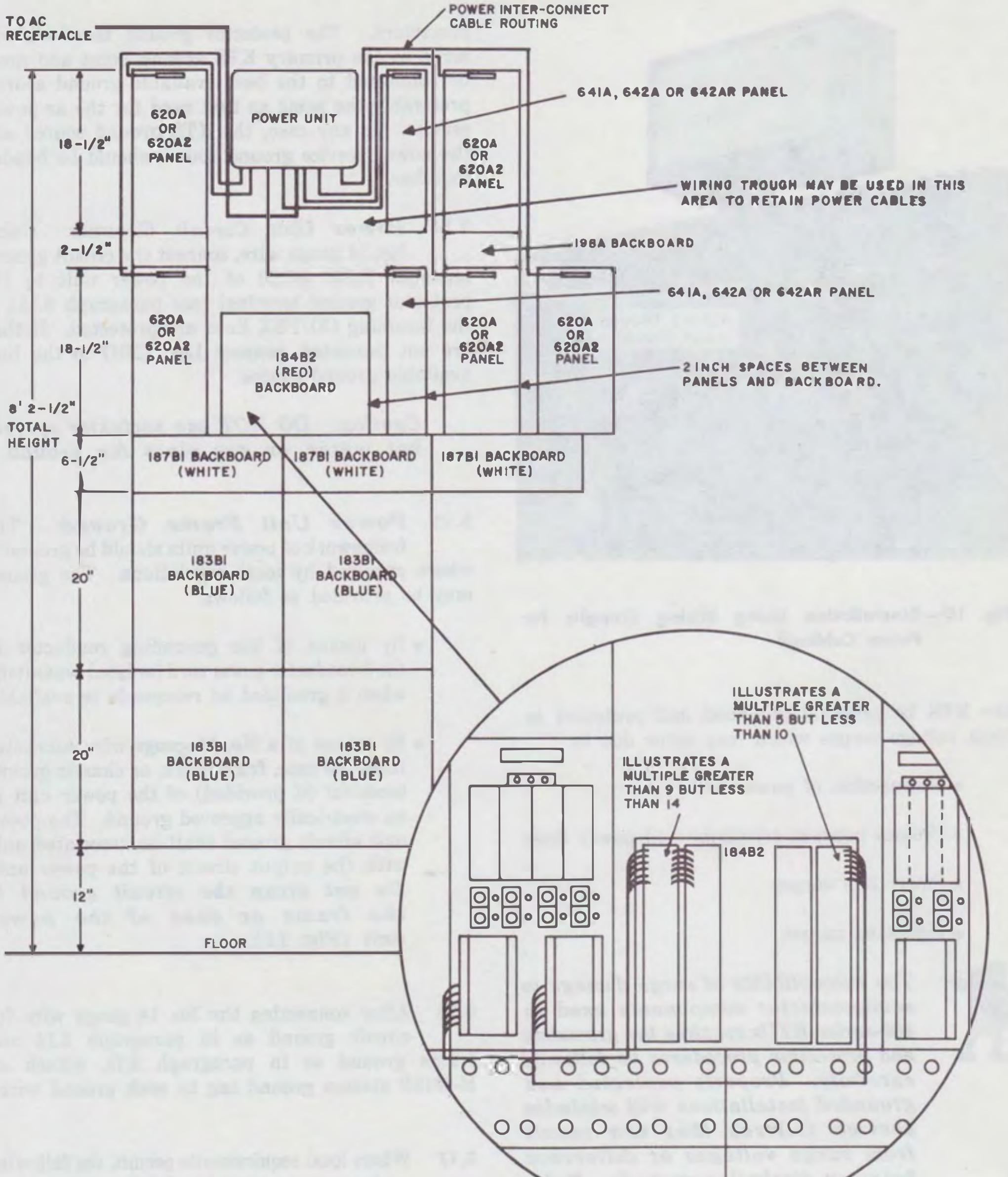


Fig. 9—◆Stacked Modular Apparatus and Method of Terminal Multipling Using 184-Type Backboards◆

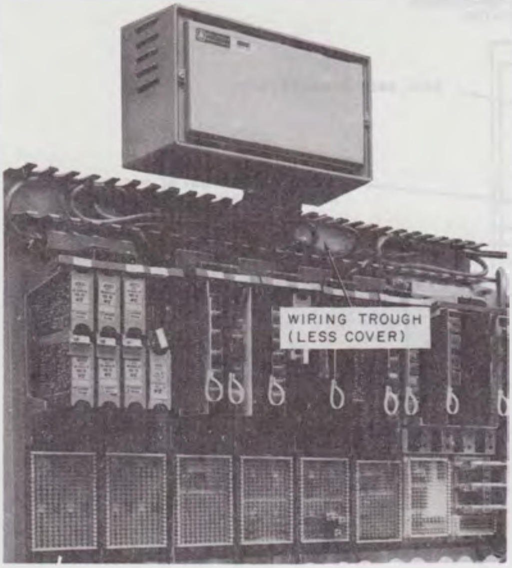


Fig. 10—♦Installation Using Wiring Troughs for Power Cabling♦

the KTS be properly grounded and protected to limit voltage surges which may occur due to:

- Malfunction of power unit
- Crosses between telephone and power lines
- Power line surges
- Lightning surges.



The susceptibility of surge damage to semiconductor components used in 400-series KTUs requires the grounding and protection procedures be followed carefully. Properly protected and grounded installations will minimize service failures that can result from surge voltages or difference between dissimilar grounds. Refer to Section 518-010-105 for coverage of KTS grounding and protection requirements.

3.13 *Protection:* It is recommended that all incoming CO/PBX lines be connected to protectors. The protector ground terminal will serve as the primary KTS ground point and must be connected to the best available ground source, preferably the same as that used for the ac power service. In any case, the KTS ground source and the power service ground source should be bonded together.

3.14 ***Power Unit Circuit Ground:*** Using No. 14 gauge wire, connect the circuit ground terminal (LOC GRD) of the power unit to the protector ground terminal (see paragraph 3.13), if the incoming CO/PBX lines are protected. If they are not protected, connect LOC GRD to the best available ground source.

Caution: DO NOT use sprinkler system, hot water, or gas pipes for ground.

3.15 ***Power Unit Frame Ground:*** The framework of power units should be grounded where required by local regulations. The ground may be provided as follows:

- By means of the grounding conductor in the 3-conductor power cord (ordered separately) when a grounded ac receptacle is available.
- By means of a No. 14 gauge wire connected from the case, framework, or chassis ground terminal (if provided) of the power unit to an electrically approved ground. The power unit circuit ground shall be associated only with the output circuit of the power unit. ***Do not strap the circuit ground to the frame or case of the power unit (Fig. 11).***

3.16 After connecting the No. 14 gauge wire for circuit ground as in paragraph 3.14 and frame ground as in paragraph 3.15, attach an E-3013B station ground tag to each ground wire.

3.17 Where local requirements permit, the following equipment, as covered in Section 167-400-210, may be employed:

- ***Power-cord plug adapter (Hubbell BL-12433)***—when a 3-conductor ac power cord must be connected to a duplex 2-conductor ac power receptacle (Fig. 12).

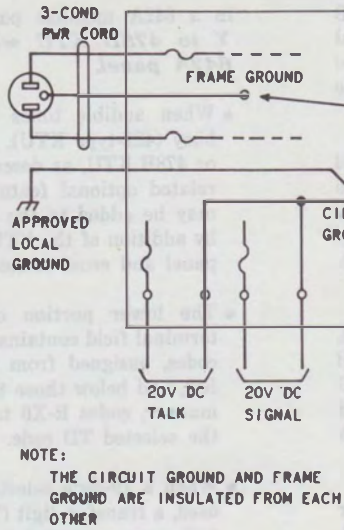


Fig. 11—Grounding of Typical Key Telephone System Installation

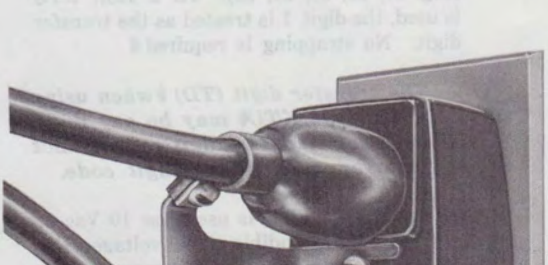


Fig. 12—Twin-Plug Retainer Mounted on a Power Cord Plug Adapter

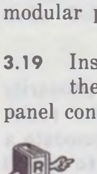
- ***Power-cord plug retainer assembly (KS-19266)***—to prevent accidental removal of a power-cord plug (Fig. 12).

Caution: AC power cord should remain disconnected from commercial ac power until completion of paragraph 3.28.

D. KTU Installation

3.18 Prior to terminating distribution of telephone set cabling, cross-connections or panel options, selected KTUs shall be unpacked, options applied as applicable, and installed in their appropriate modular panels.

3.19 Install KTUs by inserting the plug-end of the printed wiring boards into the modular panel connectors.



Exercise care when handling and inserting plug-in KTUs to avoid damage to the printed wiring and other components.

3.20 Installation of a 419A KTU (Automatic Signaling, Ringdown, Private Line), an 8-inch

unit in a 620A or 620A2 panel, requires two 913B connectors mounted in a vertical plane and removal of a guide assembly. Connections are made to the upper quadrant of the terminal field, and the lower quadrant remains vacant. See Fig. 22.

3.21 The 498A KTU (Fig. 46) provides music-on-hold for four CO/PBX lines. Three more music-on-hold circuits may be added to the 498A KTU for a total of seven music-on-hold circuits by connecting a 116A1 circuit module to the 498A KTU.

3.22 A 498A KTU is compatible with 400D (MD), G, or H KTUs. When using a 451A or B KTU to provide music-on-hold, a 400D or G KTU must be used as a line circuit, since the 400H and the 451-type KTUs are not compatible with each other.

3.23 ▶A 467A KTU can be installed in any connector of a 620A, 620A2, or 642A panel. The 467A monitors the -24 volt signal battery supply for a low-voltage condition. If the voltage drops below the adjustable level (factory adjusted at 19 volts), a light emitting diode (LED) on the KTU will light and remain lighted until the reset button is depressed. No external connections are required since the KTU checks the B voltage available through the power interconnect cord.◀

3.24 The following applies to the installation of a 641A modular panel (Fig. 26 and Table G):

- Connectors 1A and 1B are intended for an 8-inch dial intercom selector circuit (407B or 424-type KTU) ▶or a TOUCH-TONE selector circuit (498A KTU). The 498A KTU can be used to provide basic intercom in installations having TOUCH-TONE telephone sets only. Flashing lamps, audible ringback and busy tone cannot be provided when using a 498A KTU.◀

- Connectors 2A and 2B are intended primarily for an 8-inch TOUCH-TONE adapter (440A or 478B KTU) but will also accommodate a 425-type KTU. ***Add option Z to 478B KTU when installed in a 641A panel.***

Note: When a 425-type KTU is used and TOUCH-TONE service is desired, the 425-type KTU is installed in connectors 2A and 2B. The 440A or 478B KTU must then be installed in a 642A modular panel. ***Apply option Y to 478B KTU when installed in a 642A panel.***

- When audible tones (476A KTU), station busy (422-type KTU), TOUCH-TONE (440A or 478B KTU, as described above), or other related optional features are desired, they may be added to the dial intercom system by addition of the KTUs in a 642A modular panel and cross-connected as required.

- The lower portion of the quick-connect terminal field contains terminals for station codes, assigned from left to right, R-0 to R-9, and below those terminals in a similar manner, codes R-X0 to R-X9. (X indicates the selected TD code. See below.)

- When a 19-code selector (424-type KTU) is used, a transfer digit (TD) must be assigned and cross-connected from the TD terminal in the option field to the chosen digit R(0-9) terminal in the cross-connect terminal field (Fig. 27, 29, 30, 31, 32). ▶If a 498A KTU is used, the digit 1 is treated as the transfer digit. No strapping is required.◀

THINK ***The transfer digit (TD) ▶when using a 424-type KTU◀ may be any digit; once selected, the digit code cannot be used as a single digit code.***

- ▶When a 494A KTU is used, use 10 Vac or -24 Vdc only as audible signal voltage. Use of 105 Vac may result in damage to the KTU.◀

3.25 The following applies to installation of a 642A modular panel:

- Lamp positions in the line lamp and fuse block assembly are assigned to a related connector and are unequipped, except when locally provided at time of installation for use with a 417A, 418A, or 428A KTU.

Note: When a KTU is removed from service in the 642A modular panel, its related lamp, if provided, must be removed to prevent possible damage should another type KTU inadvertently be placed in the connector.

TABLE G

DIAL INTERCOM OPTIONS

FEATURE (Note 1)			OPTION
Selector Circuit	10 or 19 Codes	Non TOUCH-TONE	Z
		TOUCH-TONE	N
	10 Codes	TOUCH-TONE or Non TOUCH-TONE	F
Station Busy			ZF*
Audible Ringback			ZE*
Dial Tone			ZD*
Long Line Circuit			Q
Lamp Signal	Steady		W
	Flashing	10 Codes	H
		19 Codes	V†
Audible Signal	Interrupted (Note 2)	10V AC Buzzer	E
		110V 30-Hz Ringer	X
	Single Spurt (Note 3)	10V AC Buzzer	G
		110V 30-Hz Ringer	M
		18V AC Buzzer	J
		DC Buzzer	K

Note 1: Per SD-69567-01, Issue 14.

Note 2: 425B KTU required.

Note 3: Not to be used with station busy tone feature (422A and 476A KTUs).

* Appear on KTU option block.

† No strapping. Requires removal of H option strap.

- Appropriate KTU features may be cross-connected to other quadrants, either within the panel or to other panels, if interrelating of features is desired.
- Alphanumeric fanning strip designations are repeated for each quadrant to aid in locating and identifying terminals. (See Fig. 35 for terminal designations and connector pin identification and refer to Table A for appropriate KTU connection figure.)
- Installation of a 440A or 478B KTU, an 8-inch unit, requires the removal of a guide

assembly and connection through the lower 914B connector while occupying the space of two connectors in a vertical plane. Apply option Y to the 478B KTU.

3.26 Covers are available (Table D) for protecting the fronts and sides of modular panels. To mount a front cover (151A or 152A) on a panel, engage the hooks on the top edge with the slots at the top of the panel. Cover the sides by attaching end caps (153A) to the front covers with the clips supplied. Where several panels are mounted next to each other, the front covers form a continuous surface, and only two end caps are installed at the extreme sides.

E. Applying Power

Warning: 105 volts is present on the 105V 30-Hz RN terminals of the 620A, 620A2, and 641A panel terminal fields when power is applied.

3.27 Put a C clip terminal insulator over the 105V 30-Hz RN terminals on the 620A, 620A2, and 641A panels (see Fig. 13 and 26). One clip will cover the 105V terminal and the adjacent RN terminal.

3.28 Select appropriate length 3-conductor ac power cord and insert first into the power unit, and second into the commercial ac power receptacle. Excess length cord should be coiled, tied, and stored neatly.

3.29 If abnormal commercial ac input voltage is suspected:

(1) ***Remove the ac power cord from the ac receptacle.***

(2) Using an ac voltmeter, determine the ac voltage potential of the commercial ac receptacle.

(3) Move the ac voltage adjustment lead to that voltage tap nearest the actual line voltage.

Note: The power units are furnished with the adjustment lead connected to the 117-volt tap. With this connection, the unit will perform satisfactorily for line voltage between 111 and 123 volts.

3.30 If desired, limited testing of KTUs may be made prior to placing station cabling or cross-connections. Apply commercial ac power and test as appropriate. (See TESTING, paragraphs 5.05 and 5.06).

4. CONNECTIONS

4.01 Connection figures are grouped according to the types of services offered: CO/PBX and Private Lines, Dial Intercom, and Miscellaneous.

4.02 Preceding the 620A/620A2 and 642A modular panel connections are typical terminal field illustrations of those panels showing the upper left-hand quadrant (1A) of the quick-connect field as an example of all its quadrants (Fig. 13 and 35).

4.03 The 641A modular panel terminal field is illustrated in its entirety (Fig. 26).

4.04 Typical terminal field illustrations provide terminal and option field locations, terminal designations, connector-pin identification, and factory-furnished wiring and straps.

4.05 Connections are applied to the quick-connect terminals of the modular panels through use of the 714B tool, or equivalent.

4.06 Each quick-connect terminal is limited to termination of a single lead. Terminations in excess of panel terminal field capacity may be applied in any of the following methods most appropriate:

- ***Continuous strapping (looping)***—single leads common to more than one terminal.
- ***183A2 adapter***—provides two additional common terminals and is applied atop two terminals of like-designations in a horizontal plane.
- ***183B2 adapter***—provides two additional, but separate, terminals and is applied atop two terminals in a vertical plane.
- ◆***16A1-160 terminal block***—for additional line service terminations in excess of 620A/620A2 or 642A panel capacity (Fig. 8).◆

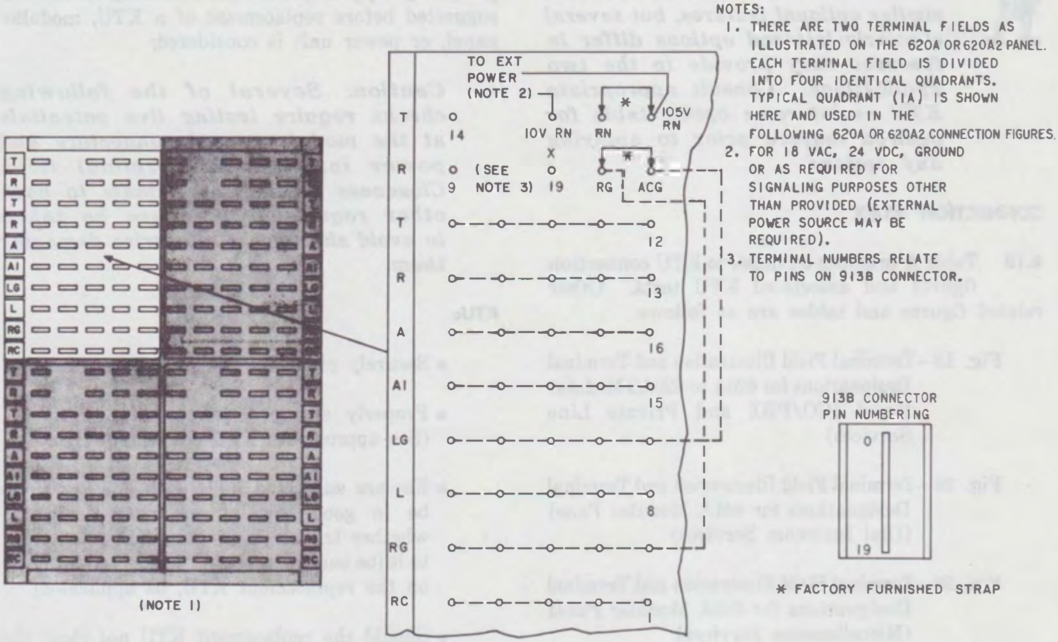


Fig. 13—▶Terminal Field Illustration and Terminal Designations for 620A or 620A2 Panel (CO/PBX and Private Line Services)◀

- ***66B4-25 connecting block on a 184A1, B1, or B2 (RED) backboard***—for additional line service terminations in excess of 620A/620A2 or 642A panel capacity (Fig. 9).

- ***66B3-50 or 66B4-25 connecting block on a 185A1 (YELLOW) backboard***—for additional dial intercom terminations in excess of 641A panel capacity (Fig. 7).

4.07 The 620A or 620A2 modular panel fanning strips are predesignated for typical line services and repeated for each quadrant (Fig. 13). Exceptions to the designations are the following:

- 401-type KTU—spare leads SP-1, SP-2, and SP-3 are substituted for T, R, and RC, respectively (Fig. 17).

- 413A KTU—spare leads SP-1, SP-2, SP-3, and SP-4 are substituted for T, R, A, and L, respectively (Fig. 18).

- 414A, 461A, and 416A KTUs—S and SG leads are substituted for A and A1, respectively (Fig. 19 and 21).

- 471A/B and 479B KTUs—A(U) and A leads are substituted for A and RC, respectively (Fig. 24 and 25).

4.08 KTU options: Apply to optional features offered by individual KTUs; they are indicated in table form on their connection figures only.

4.09 Intercom options (Table G): Wiring of associated KTUs providing features directly affecting or adding to the dial intercom system.



Many KTU and intercom system options share like-designations and provide similar optional features, but several similarly-lettered options differ in features they provide in the two applications. Consult appropriate KTU or intercom option table for desired feature prior to applying any options.

CONNECTION INDEX

4.10 Table A provides an index to KTU connection figures and associated KTU tests. Other related figures and tables are as follows:

Fig. 13—Terminal Field Illustration and Terminal Designations for 620A or 620A2 Modular Panel (CO/PBX and Private Line Services)

Fig. 26—Terminal Field Illustration and Terminal Designations for 641A Modular Panel (Dial Intercom Services)

Fig. 35—Terminal Field Illustration and Terminal Designations for 642A Modular Panel (Miscellaneous Services)

Table H—Dial Intercom Arrangements (Fig. 27 through 32).

5. MAINTENANCE

5.01 Maintenance of 600-series modular panels can be done in the areas of:

- Checks of terminal field cross-connections
- Replacement of defective fuses, lamps, and KTUs
- Continuity testing (913/914-type connectors, power interconnect terminals, and cable connectors, etc). Consult Table F and Fig. 1 through 4.

5.02 As a key telephone system, maintenance is limited to normal station repairs, wiring checks, and replacement of defective components.

5.03 When trouble is encountered, ***first perform a thorough check of all cross connections and, second, assure all station connections and related apparatus are properly applied;*** then the following checks are suggested before replacement of a KTU, modular panel, or power unit is considered:

Caution: Several of the following checks require testing live potentials at the modular panel connectors and power interconnect terminal field. Closeness of these terminals to each other requires extra care be taken to avoid shorting or otherwise damaging them.

KTUs

- Securely placed in proper connectors.
- Properly strapped for required option(s). (See appropriate KTU connection figures.)
- Replace suspected KTU with one known to be in good working order to determine whether trouble is in the KTU or external to it [be sure to strap in the correct option(s) on the replacement KTU, as applicable].
- Should the replacement KTU not clear the trouble, the trouble is external to it and the original KTU should be placed back in service.

MODULAR PANELS (Check as Applicable)

- Option straps(s) properly applied.
- Fuses in place and in good working condition (Fig. 5).
- Lamps in place and in good condition.
- Plug end of modular panel power interconnect cable securely positioned in power unit connector.
- KTUs securely mounted in 913/914-type connectors with retainer and/or guide assemblies in place.
- Dedicated leads (Table F) may be tested for appropriate potential or function.

Caution: Power interconnect cable must be disconnected and modular

➧TABLE H➧

DIAL INTERCOM ARRANGEMENTS

DIAL INTERCOM FEATURE		KTU	FIGURE 27		28	29		30		31	32
			BASIC			DELUXE					
						WITHOUT STATION BUSY OPTION				WITH STATION BUSY OPTION	
			R	TT	TT	R	TT	R	TT	R	TT
Selector Codes	10	407	•	•		•	•	•	•	•	•
	19	424									
TOUCH-TONE Selector	19	494			•						
Dialing	R	†	†			†		†		†	
	TT	440/478		•			•		•		•
Station Busy Selector		422								•	•
Audible Tones		476						•	•	•	•
Flashing Lamps*		425				•	•	•	•	•	•

• Indicated KTU required.

† No KTU required.

* Interrupter required with flashing lamps.

panel void of KTUs prior to attempting the following test.

- Dedicated leads (Table F) may be continuity tested between the KTU connectors within a given panel.
- Using the appropriate modular panel terminal field illustration (Fig. 13, 26, or 35), continuity tests of the nondedicated wiring may be made between the KTU connectors and the terminal field.
- Continuity testing of power unit interconnect cable leads may be performed.

POWER UNIT (Fig. 6)

- All fuses in place and in good condition.
- AC power cord securely in place in both the commercial ac receptacle and the power unit input connector.
- Commercial ac input present at receptacle and not controlled by a switch.
- Interrupter securely in place and operative. Place ground on start lead (MS) pin at power interconnect cable terminal field of modular panel (Fig. 1) and, using 1013A

test set or equivalent, test for interrupted potentials on the LW, LF, 10 Vac RN, and 105V RN terminals in the modular panel power interconnect field. LW does not appear on the 641A panel. Remove MS ground when check is completed.

- Using 1013A test set, or equivalent, verify that battery, ground, and signal potentials are present at output taps on the face of the power unit panel.

- Circuit and frame grounds properly applied (see paragraphs 3.14 and 3.15).

- AC voltage adjustment lead on appropriate tap.

5.04 If the above checks fail to reveal the source of trouble, it can be reasonably assumed that the trouble is external to the power units, modular panels, and KTUs, and that cross-connections, station wiring, and components should be checked.

TESTING

5.05 Prior to termination of cross-connections, station and distributing cabling, continuity testing may be performed between terminal field terminals and like-designated connector pins. See appropriate terminal field illustration.

Caution: Power unit connector cable must be disconnected and modular panel void of KTUs before attempting continuity tests.

5.06 The line lamp or circuit busy lamp (641A panel), provided in the lamp and fuse block assembly, offers a visual indication of a circuit under operational test.

TESTS

5.07 It is impractical to attempt operational tests of several KTUs prior to termination of appropriate cross-connections. The following KTUs may be tested at the modular panel regardless of cross-connections, station or distributing cables applied. The tests appear adjacent to the related KTU connection figures. (All circuits must be idle prior to starting tests.) The tests are:

*A. **400-Type KTU—CO/PBX Line Circuit***

*B. **401-Type KTU—Manual Intercom Circuit***

*C. **414A and 461A KTU—Manual Signaling, Ringdown, Private Line***

*D. **415A KTU—Automatic, DC Signaling, Ringdown, Private Line***

*E. **416A KTU—Station Line Circuit***

*F. **419A KTU—Automatic Signaling, Ringdown, Private Line***

*G. **469A KTU—Lamp Extender***

*H. **471A/B KTU—Battery Reversal Toll Restriction***

*I. **407B and 424-Type KTUs—Dial Intercom Selector Circuit***

*J. **◆494A KTU—TOUCH-TONE Selector Circuit◆***

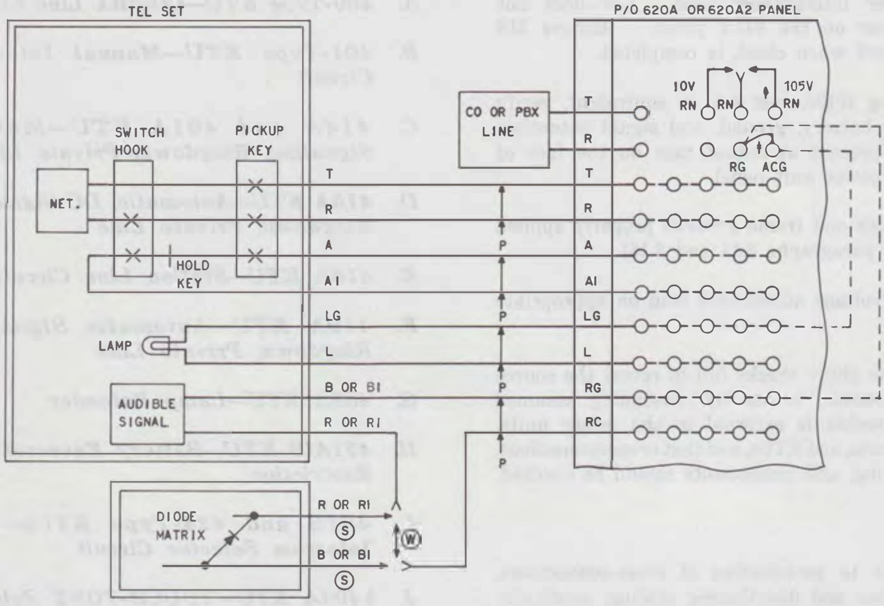
*K. **420A KTU—Long Line Circuit***

*L. **417A KTU—Add-On Conference Circuit***

*M. **418A KTU—Short Range, DC Signaling, Private Line***

*N. **◆451B or 498A KTU—Music-On-Hold (MOH) Circuit◆***

5.08 ***Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.



OPTION STRAPPING (SEE NOTE 1)

FEATURES			KTU OPTION	OPTION STRAPPING ON: MODULAR PANEL CONN BLK	OPTION STRAPPING ON: 400D KTU
AUDIBLE SIGNALS (INTERRUPTED)	WITHOUT DIODE MATRIX CONTROL	10V AC	W	10 RN TO RN	5 TO 8
		105V AC		105V RN TO RN	
	WITH DIODE MATRIX CONTROL	10V AC	S	10 RN TO RN	
		105V AC		105V RN TO RN	
VISUAL HOLD CIRCUIT	LAMP WINK		Y		7 TO 10,
	LAMP STEADY		X		7 TO 9,
RING TIMEOUT	SHORT TIME DELAY (10 SECONDS)		Z *		1 TO 2,
	LONG TIME DELAY (30 SECONDS)		†	†	
RELEASE OF HOLDING BRIDGE FROM CO OR PBX LINE CURRENT OPENS GREATER THAN	500 MILLISECONDS WHEN ASSOCIATED WITH NO.1 ESS HAVING RESWITCH CAPABILITY		ZC	2 TO 3 USING 601A (5 UF) CAPACITOR OR EQUIVALENT §	
	100 MILLISECONDS WHEN ASSOCIATED WITH 800A PBX AND/OR NO.5 X-BAR CENTREX NOT HAVING AUTOMATIC PERMANENT SIGNAL RELEASE		ZD (NOTE 2)	2 TO 3 USING 575C (1 UF) CAPACITOR OR EQUIVALENT	
	50 MILLISECONDS WHEN ASSOCIATED WITH NO.5 X-BAR CENTREX HAVING AUTOMATIC PERMANENT SIGNAL RELEASE		ZJ	2 TO 3 USING 575B (0.5 UF) CAPACITOR OR EQUIVALENT	

NOTES:

1. THE 400D KTU IS FACTORY WIRED FOR 10-SECOND TIMEOUT, PLUS WINKING-HOLD LAMP, AND W AND S WIRING OPTIONS.
2. ZD OPTION IS REPLACED BY ZJ OPTION, HOWEVER IT IS NOT NECESSARY TO UPDATE CIRCUITS PREVIOUSLY MODIFIED WITH OPTION ZD.

* TO PROVIDE TIME-OUT CYCLES OF RING-UP CIRCUITS FROM 3.4 TO 7.5 SECONDS. INSTALL KS-13490,L1, 1 WATT OR EQUIVALENT RESISTOR BETWEEN TERMINALS 1 AND 3 WITH A STRAP FROM 1 TO 2. TIME-OUT CYCLE AND RESISTOR VALUES ARE AS FOLLOWS:
3.4 SECONDS – 0.20 MEGOHM RESISTOR
5.0 SECONDS – 0.39 MEGOHM RESISTOR
6.7 SECONDS – 0.75 MEGOHM RESISTOR
7.5 SECONDS – 1.2 MEGOHM RESISTOR
WHEN THE DURATION OF MACHINE RINGING IS 1 SECOND OR LESS, TIME-OUT SHALL NOT BE REDUCED BELOW 5 SECONDS.

† FOR 30 SECOND TIME-OUT CYCLE REMOVE ALL STRAPS FROM TERMINALS 1, 2 AND 3.

‡ FACTORY FURNISH STRAPS

§ INSTALL POLARIZED CAPACITOR AS FOLLOW:

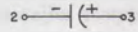
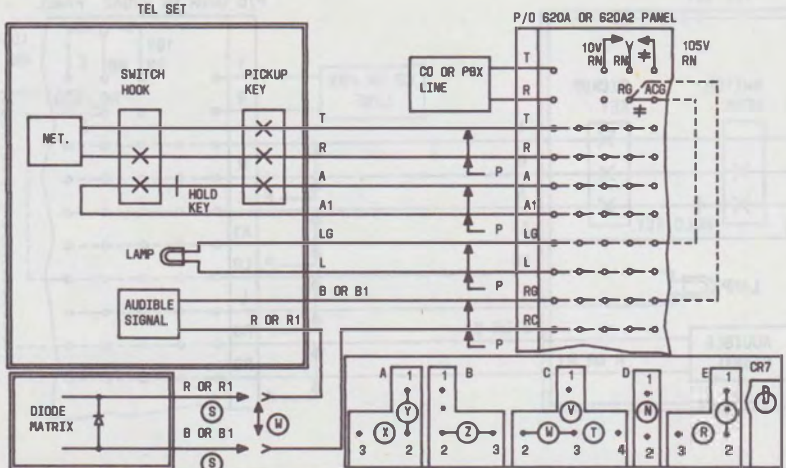


Fig. 14—▶400D (MD) KTU Connections (CO/PBX Line) in 620A or 620A2 Panel◀



TOP VIEW OF THE OPTION BLOCK-HANDLE ASSEMBLY. THE OPTION SYMBOLS THAT ARE SHOWN CONNECTED TO TERMINALS INDICATE FACTORY PROVIDED OPTIONS.

* OPTION PLUG STORAGE POSITION (FOR USE WHEN ASSOCIATED OPTION IS NOT REQUIRED).

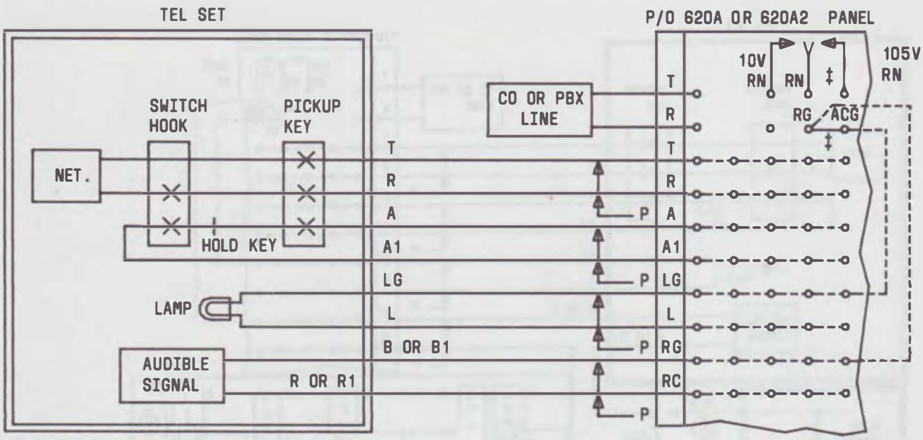
✦ FACTORY FURNISHED

OPTION		FEATURE		CONNECT TERMINALS
M	RING TIMEOUT	LONG TIME DELAY (APPROXIMATELY 20 SECONDS)		B1-B2
Z		SHORT TIME DELAY (APPROXIMATELY 5.75 SECONDS)		B2-B3✦
Y	VISUAL HOLD CKT	LAMP WINK		A1-A2✦
X		LAMP STEADY		A2-A3✦
W	AUDIBLE SIGNAL	INTERRUPTED RING		C2-C3✦
T		STEADY RING		C3-C4
S		COMMON WITH DIODE MATRIX CONTROL		
V		COMMON WITH RELAY CONTROL		C1-C3
R	DELAYED HOLD RELEASE	RELEASE OF HOLDING BRIDGE FROM CO OR PBX BY LINE CURRENT OPENS	MINIMUM OF 25 MS	E2-E3
K			600MS	E1-E2

RELAY	FUNCTION: INC RING CYCLE	FUNCTION: ANS OR INIT CALL	FUNCTION: HOLD
A	R	O	R
B	O	R	O
C	R	O	O
L	O*	R	O

R = RELEASED
O = OPERATE
* = FOLLOWS RINGING

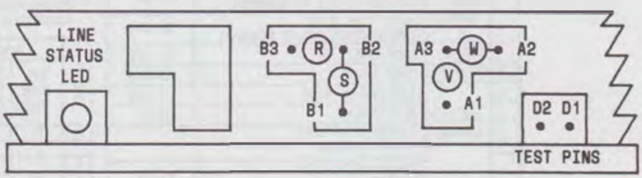
Fig. 15—➧400G KTU Connections (CO/PBX Line) in 620A or 620A2 Panel⬅



OPTIONS

OPT	FEATURES	
T*	CO OR PBX LINE CIRCUIT	
W*	AUDIBLE SIGNAL	INTERRUPTED RING
V		COMMON AUDIBLE WITH GROUND FOR RELAY CONTROL
S*	HOLD CIRCUIT RELEASE	LONG HOLD ABANDON TIMEOUT (FOR ESS #1, ESS #2, 812 PBX, 770 PBX, DIMENSION PBX)
R		SHORT HOLD ABANDON (FOR ALL OTHERS)

*FACTORY INSTALLED



TOP VIEW OF OPTION BLOCK-HANDLE ASSEMBLY. OPTION SYMBOLS SHOWN CONNECTED ARE IN FACTORY INSTALLED POSITIONS.

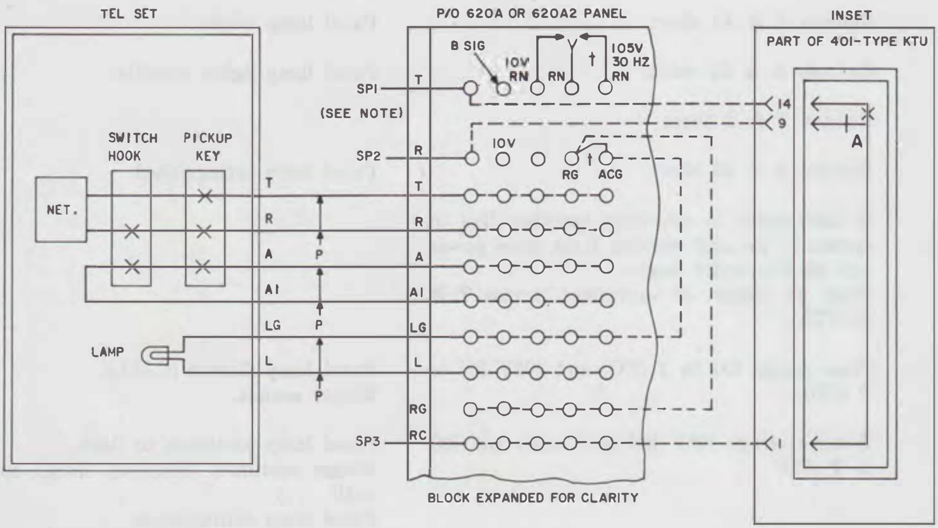
RELAY	FUNCTION		
	INCOMING RING-CYCLE	ANSWERING OR INITIATING CALL	HOLD
R	O	RL	RL
H	RL	RL	O

RL – RELEASED
O – OPERATED

Fig. 16—▶400H KTU Connections (CO/PBX Line) in 620A or 620A2 Panel◀

A. 400-Type KTU—CO/PBX Line Circuit (Fig. 14, 15, and 16)

STEP	ACTION	VERIFICATION
1	Short A & A1 terminals.	Panel lamp lights steadily (BUSY).
2a	If CO or PBX T & R battery is present— Maintaining A & A1 short, short T & R (STA) terminals.	
3a	Remove A & A1 short.	Panel lamp winks.
4a	Reapply A & A1 short.	Panel lamp lights steadily.
5a	Remove T & R short.	
6	Remove A & A1 short.	Panel lamp extinguished.
7b	If interrupter is operating (another line in system in use and working from same power unit as line under test)— Place E1 ringer, or equivalent, across T & R (STA).	
8b	Place straps RG to T (CO) and 105V RN to R (CO).	Panel lamp flashes (CALL). Ringer sounds.
9	Remove straps 105V RN to R (CO) and RG to T (CO)	Panel lamp continues to flash. Ringer continues (Time-out circuit operating until . . .) Panel lamp extinguishes. Ringer silences. (Time-out complete.)
10b	Remove ringer from T & R (STA).	(END TEST)



NOTE:
SP1, SP2, AND SP3 LEADS CAN BE USED FOR CONTROL PURPOSES AS REQUIRED (SEE INSET). ON 620A2 PANELS, 10V AC OR B SIG CAN BE CONNECTED ON TERMINAL FIELD TO OPERATE AUDIBLE SIGNAL. 10V AC TERMINAL APPEARS IN ALL EIGHT QUADRANTS – B SIG APPEARS IN 1A ONLY.

Fig. 17—▶401-Type KTU Connections (Manual Intercom) in 620A or 620A2 Panel◀

B. 401-Type KTU—Manual Intercom Circuit (Fig. 17)

STEP	ACTION	VERIFICATION
1	Place 1013A, or equivalent, test set (MONITOR) across T & R (STA) terminals.	
2	Put test key in TALK position.	Sidetone heard.
3	Put test key in MONITOR position.	Sidetone lost.
4	Apply A & A1 short.	Panel lamp lights steadily.
5	Remove A & A1 short.	Panel lamp extinguished.
6	Remove test set from terminals.	(END TEST)

OPTION

FEATURE			OPTION STRAPPING ON		
			MODULAR PANEL	413A KTU	KTU OPTION
AUDIBLE SIGNAL	INTERRUPTED	10V	10V RN TO RN	8 TO 10	Z
		105V	105V RN TO RN *		

* FACTORY FURNISHED STRAP

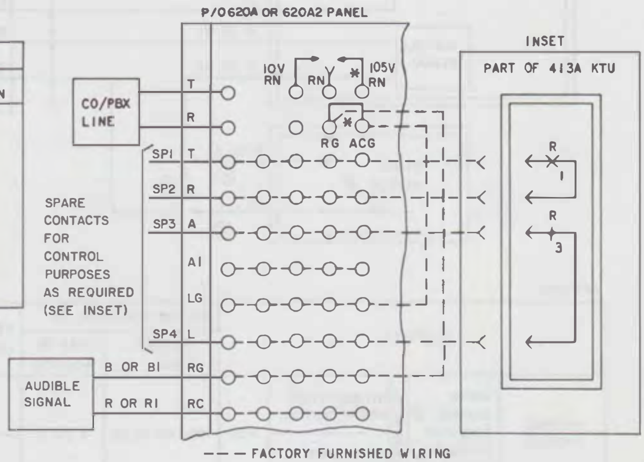
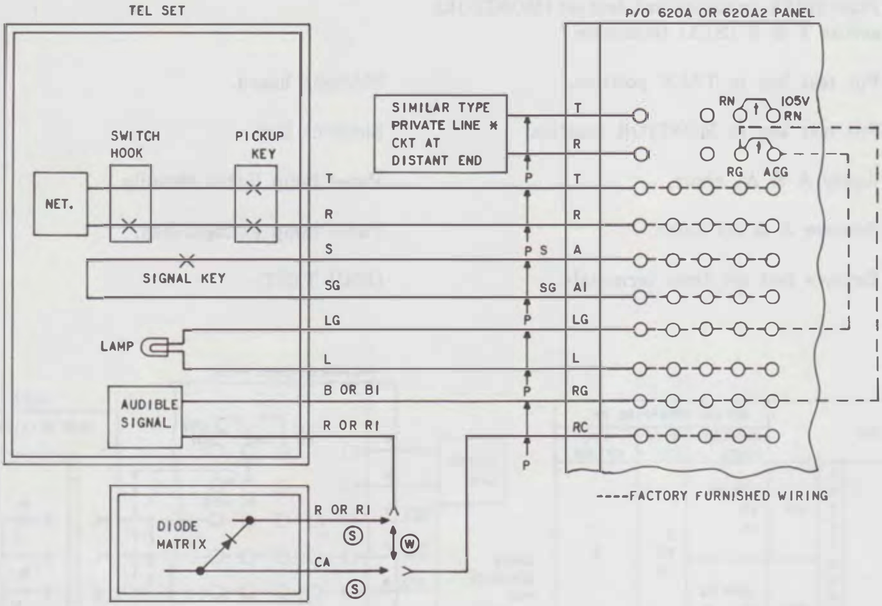


Fig. 18—413A KTU Connections (Auxiliary Ringup) in 620A or 620A2 Panel



OPTIONS

FEATURES					OPTION STRAPPING ON		KTU OPTION
					MODULAR PANEL	414A OR 461A KTU	
AUDIBLE SIGNALS	UNDER CONTROL OF TIME-OUT CIRCUIT (B RELAY)	INTERRUPTED	WITHOUT DIODE MATRIX CONTROL	105V	105V RN TO RN	7 TO 8	W†
			WITH DIODE MATRIX CONTROL				S†
TIME-OUT	10 SECONDS					1 TO 2	X
	16 SECONDS					2 TO 3	Z
	23 SECONDS					REMOVE X OR Z STRAPS	WITHOUT X OR Z
AUDIBLE RINGBACK TONE						9 TO 10	M

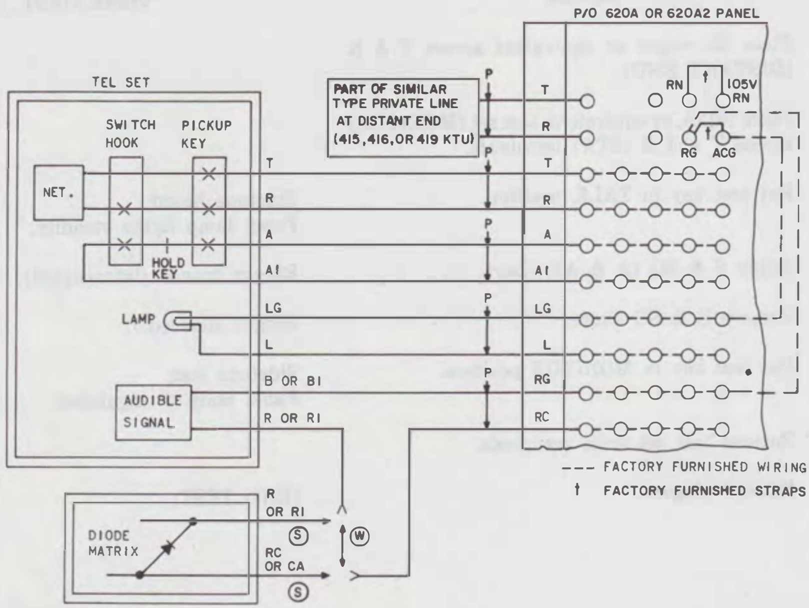
* CIRCUIT AT DISTANT END MAY BE A 414A KTU 419A KTU, 461A KTU, OR ANY OTHER TYPE PRIVATE LINE UNIT WHOSE RINGUP CIRCUIT REQUIRES RINGING VOLTAGE AND WHOSE SIGNALING CIRCUIT SENDS OUT SIGNALING VOLTAGE.

† FACTORY FURNISHED STRAP

Fig. 19—▶414A KTU and 461A KTU Connections (Manual Signaling, Ringdown, Private Line) in 620A or 620A2 Panel◀

C. 414A KTU and 461A KTU—Manual Signaling, Ringdown, Private Line (Fig. 19)

STEP	ACTION	VERIFICATION
1	Place E1 ringer or equivalent across T & R (DISTANT END).	
2	Place 1013A, or equivalent, test set (MONITOR) across T and R (STA) terminals.	
3	Put test key in TALK position.	Sidetone heard; Panel lamp lights steadily.
4	Apply S & SG (A & A1) short.	Ringer sounds (interrupted).
5	Remove S & SG short.	Ringer silenced.
6	Put test key in MONITOR position.	Sidetone lost; Panel lamp extinguished.
7	Remove test set from terminals.	
8	Remove ringer.	(END TEST)



OPTIONS *

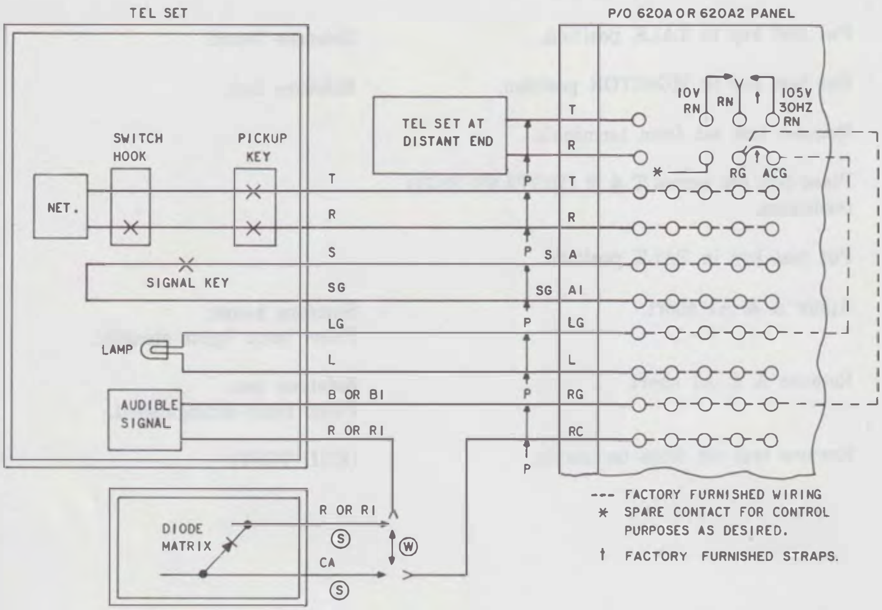
FEATURES				OPTION STRAPPING ON: MODULAR PANEL CONN BLOCK	OPTION STRAPPING ON: 415A KTU	KTU OPTION
AUDIBLE SIGNALS	INTERRUPTED	WITHOUT DIODE MATRIX CONTROL	105V	105V RN TO RN	4 TO 6	W†
		WITH DIODE MATRIX CONTROL				S†
AUDIBLE RINGBACK TONE					1 TO 2	M†
VISUAL HOLD SIGNAL					7 TO 8	Y†

* FOR IDLE LINE TERMINATION CONNECT A KS-13490, L1 910-OHM RESISTOR IN SERIES WITH A 542F, 2UF CAPACITOR ACROSS TERMINALS 9 AND 10. ORDER COMPONENTS LOCALLY AND INSTALL.

Fig. 20—◆415A KTU Connections (Automatic, DC Signaling, Ringdown, Private Line) in 620A or 620A2 Panel◆

D. 415A KTU—Automatic, DC Signaling, Ringdown, Private Line (Fig. 20)

STEP	ACTION	VERIFICATION
1	Place 1013A, or equivalent, test set (MONITOR) across T & R (STA) terminals.	
2	Put test key in TALK position.	Sidetone heard.
3	Put test key in MONITOR position.	Sidetone lost.
4	Remove test set from terminals.	
5	Place test set across T & R (DISTANT END) terminals.	
6	Put test key in TALK position.	
7	Apply A & A1 short.	Sidetone heard; Panel lamp lights steadily.
8	Remove A & A1 short.	Sidetone lost; Panel lamp extinguished.
9	Remove test set from terminals.	(END TEST)



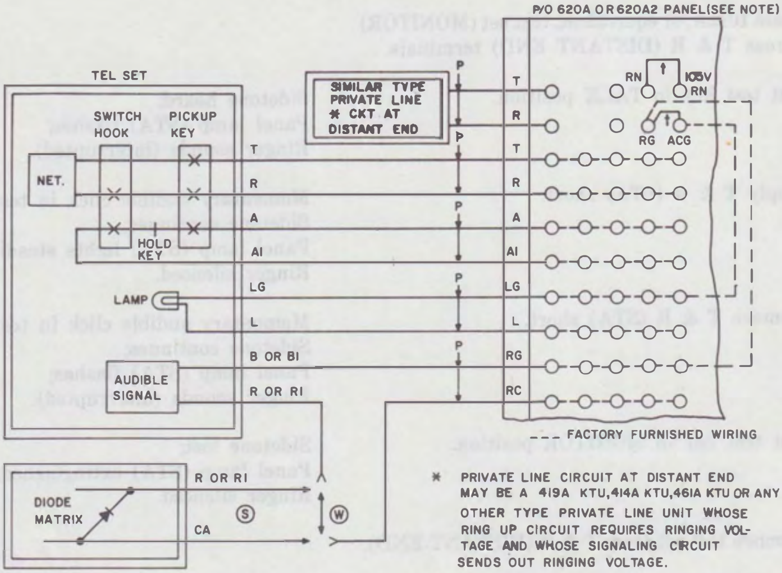
OPTIONS

FEATURES				OPTION STRAPPING ON		KTU OPTION
				MODULAR PANEL	416A KTU	
AUDIBLE SIGNALS	INTERRUPTED	WITHOUT DIODE MATRIX CONTROL	10V	10V RN TO RN	5 TO B	W†
			105V	105V RN TO RN		
		WITH DIODE MATRIX CONTROL	10V	10V RN TO RN		S†
			105V	105V RN TO RN		
AUDIBLE RINGBACK TONE					9 TO 10	M†

Fig. 21—▶416A KTU Connections (Station Line) in 620A or 620A2 Panel◀

E. 416A KTU—Station Line Circuit (Fig. 21)

STEP	ACTION	VERIFICATION
1	Place ringer across RG & RC terminals.	
2	Place 1013A, or equivalent, test set (MONITOR) across T & R (DISTANT END) terminals.	
3	Put test key in TALK position.	Sidetone heard; Panel lamp (STA) flashes; Ringer sounds (interrupted).
4	Apply T & R (STA) short.	Momentary audible click in test set; Sidetone continues; Panel lamp (STA) lights steadily; Ringer silenced.
5	Remove T & R (STA) short.	Momentary audible click in test set; Sidetone continues; Panel lamp (STA) flashes; Ringer sounds (interrupted).
6	Put test key in MONITOR position.	Sidetone lost; Panel lamp (STA) extinguished; Ringer silenced.
7	Remove test set from T & R (DISTANT END).	
8	Remove ringer from RG & RC terminals.	(END TEST)



* PRIVATE LINE CIRCUIT AT DISTANT END MAY BE A 419A KTU, 414A KTU, 461A KTU OR ANY OTHER TYPE PRIVATE LINE UNIT WHOSE RING UP CIRCUIT REQUIRES RINGING VOLTAGE AND WHOSE SIGNALING CIRCUIT SENDS OUT RINGING VOLTAGE.

† FACTORY FURNISHED STRAPS

FEATURES					OPTION STRAPPING ON: MODULAR PANEL	OPTION STRAPPING ON: 419A KTU	KTU OPTION
AUDIBLE SIGNALS	UNDER CONTROL OF TIME-OUT CIRCUIT (B RELAY)	INTERRUPTED	WITHOUT DIODE MATRIX CONTROL	105V AC	105V RN TO RN	6 TO 8	W†
			WITH DIODE MATRIX CONTROL				S†
TIME-OUT	6 SECONDS					9 TO 10	X
	17 SECONDS					7 TO 10	Z
	25 SECONDS					REMOVE X OR Z STRAPS	WITHOUT X OR Z
AUDIBLE RINGBACK TONE						1 TO 2	M†

NOTE:
INSTALLATION OF A 419A KTU IN A 620A OR 620A2 PANEL REQUIRES TWO 913B CONNECTORS IN A VERTICAL PLANE AND REMOVAL OF A GUIDE ASSEMBLY. CONNECTIONS ARE MADE TO THE UPPER QUADRANT OF THE TERMINAL FIELD AND THE LOWER QUADRANT REMAINS VACANT.

Fig. 22—▶419A KTU Connections (Automatic Signaling Ringdown, Private Line) in 620A or 620A2 Panel◀

F. 419A KTU—Automatic Signaling, Ringdown, Private Line (Fig. 22)

STEP	ACTION	VERIFICATION
1	Place ringer across T & R (DISTANT END) terminals.	
2	Place 1013A, or equivalent, test set (MONITOR) across T & R (STA) terminals.	
3	Put test key in TALK position.	Sidetone heard.
4	Apply A & A1 short.	Ringer (DISTANT END) sounds; Panel lamp (STA) lights steadily.
5	Remove A & A1 short.	Ringer (DISTANT END) silenced; Panel lamp extinguished.
6	Put test key in MONITOR position.	Sidetone lost.
7	Remove test set from T & R (STA).	
8	Move ringer from T & R (DISTANT END) terminals to RC & RG (STA) terminals.	
9	Factory furnished straps RN to 105V RN and RG to ACG in place, add strap RG to T (DISTANT END) and strap RN to R (DISTANT END).	Ringer (STA) sounds; Panel lamp flashes.
10	Apply A & A1 short.	Ringer (STA) silenced; Panel lamp lights steadily.
11	Remove A & A1 short.	Ringer (STA) sounds; Panel lamp flashes.
12	Remove RN to R (DISTANT END) strap.	Ringer (STA) silenced; Panel lamp extinguished.
13	Remove RG to T (DISTANT END) strap.	
14	Remove ringer from T & R (STA) terminals.	(END TEST)

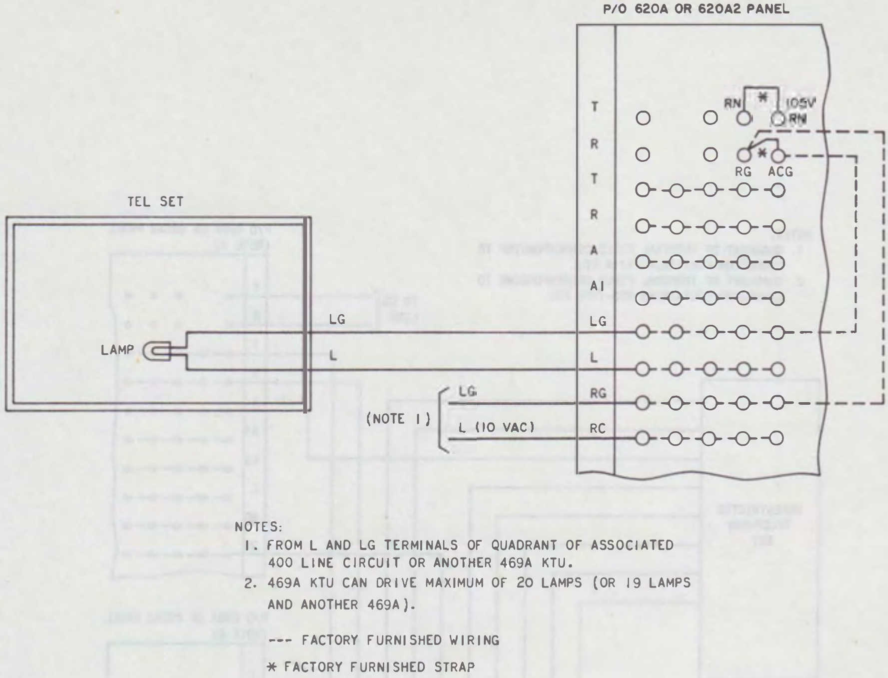


Fig. 23—♦469A KTU Connections (Lamp Extender) in 620A or 620A2 Panel♦

G. 469A KTU—Lamp Extender (Fig. 23)

STEP	ACTION	VERIFICATION
1	Place strap from 10V RN terminal on panel to RC (L lead) terminal.	Panel lamp flashes.
2	Remove strap.	Panel lamp extinguished.
		(END TEST)

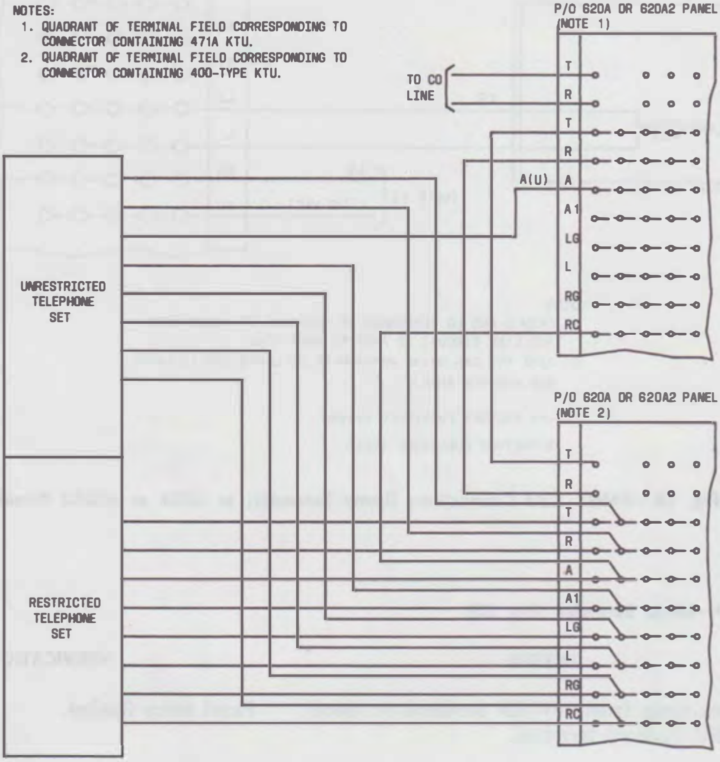


Fig. 24—471A/B KTU Connections (Battery Reversal Toll Restriction) in 620A or 620A2 Panel

H. 471A/B KTU—Battery Reversal Toll Restriction (Fig. 24)

STEP	ACTION	VERIFICATION
1	Test requires that CO line be connected to T and R (CO) terminals.	
2	Strap A1 and RC terminals.	
3	Connect 1013A test set or equivalent to T and R (STA) terminals with switch in MONITOR.	
4	Operate switch to TALK.	Dial tone heard.
5	Dial toll code.	CO line opened for approximately 1 second. Dial tone heard.
6	Operate switch to MONITOR.	CO disconnects.
7	Move strap to A1 and A terminals.	
8	Operate switch to TALK.	Dial tone heard.
9	Dial toll code.	Call not restricted.
10	Operate switch to MONITOR. Remove 1013A test set and A1 and A strap.	(END TEST)

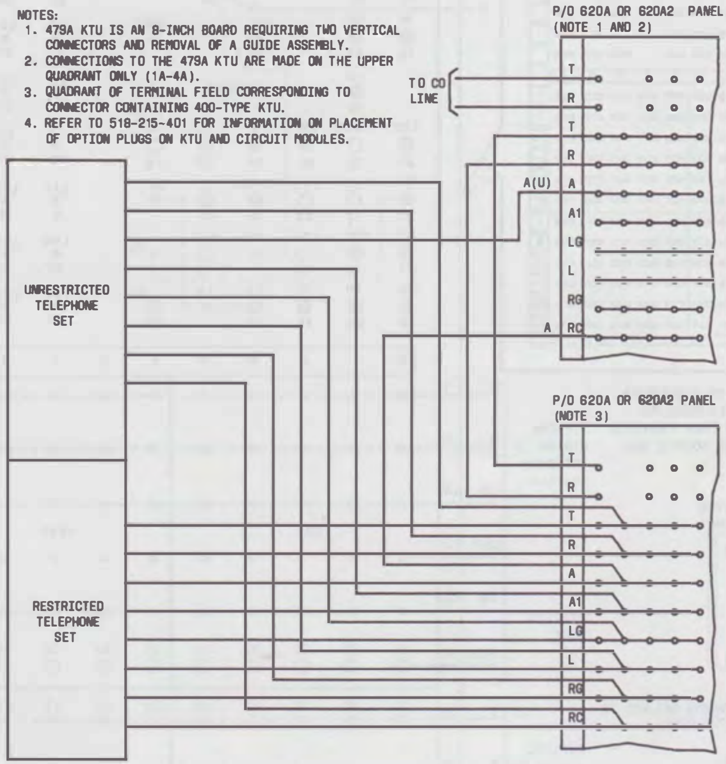
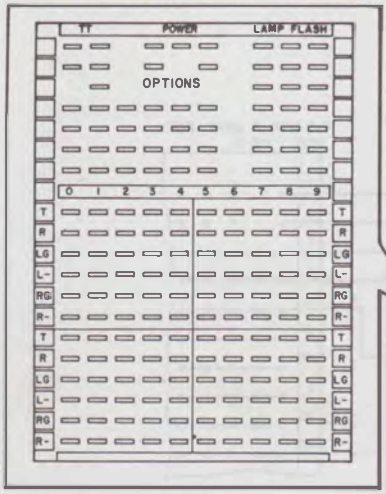
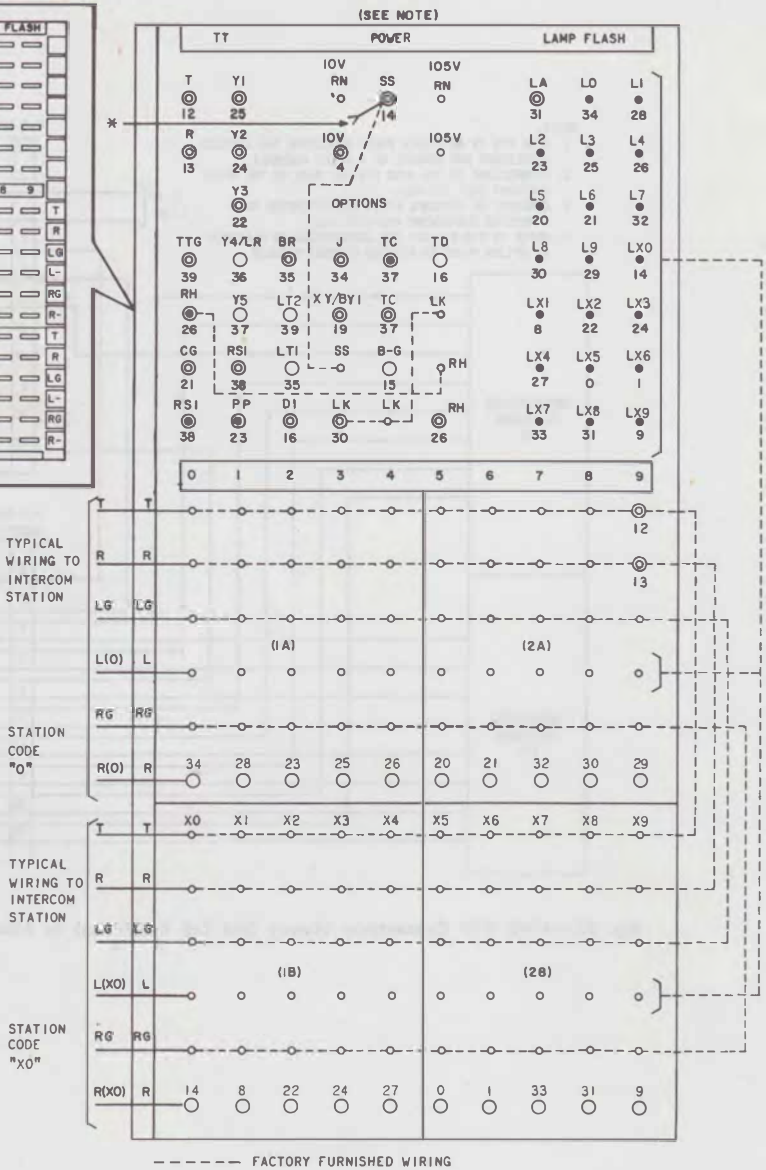


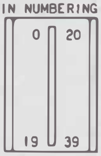
Fig. 25—479B KTU Connections (Rotary Dial Toll Restriction) in 620A or 620A2 Panel





* FOR 18V AC, 24V DC, GROUND OR AS REQUIRED FOR SIGNALING PURPOSES OTHER THAN PROVIDED (EXTERNAL POWER SOURCE MAY BE REQUIRED)

914B CONNECTOR PIN NUMBERING



NOTE:
TERMINAL NUMBERS RELATE TO 914B CONNECTOR PINS.

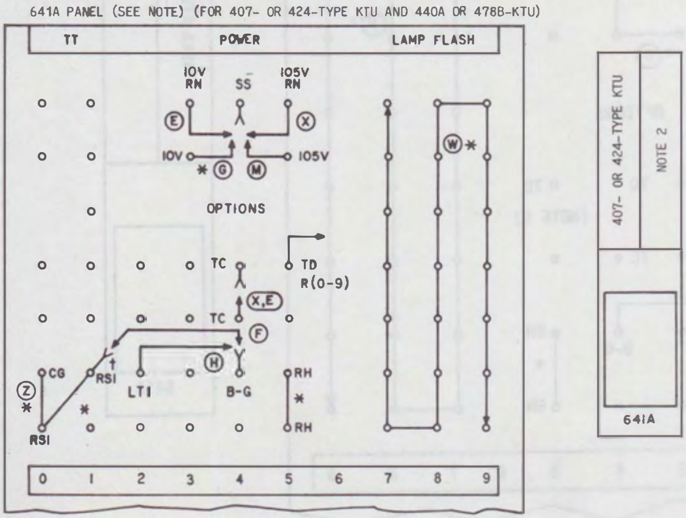
LEGEND

CONNECTOR	TERMINAL SYMBOL
1A	○
1B	◎
2A	•
2B	◉

Fig. 26—Terminal Field Illustration and Terminal Designations for 641A Panel (Dial Intercom Services)

I. 407B and 424-Type KTUs—Dial Intercom Selector Circuit (Fig. 26)

STEP	ACTION	VERIFICATION
1	Place appropriate type audible signal device (bell or buzzer) across RG & R-5 terminals.	
2	Place 1013A, or equivalent, test set (MONITOR) across T & R (STA) terminals.	
3	Put test key in TALK position.	Sidetone heard; Panel lamp lights steadily.
4	Dial digit 5.	Audible signal sounds.
5	Put test key in MONITOR position.	Sidetone lost; Panel lamp extinguished.
6	Remove test set from terminals.	
7	Remove audible signal device.	
8a	If 407-type KTU under test—	(END TEST)
9b	If 424-type KTU under test— Place appropriate type audible signal device across RG & R-X7 terminals.	
10b	Strap TD terminal to R-2 terminal. (R-2 selected as transfer digit for testing purposes.)	
11b	Place 1013A, or equivalent, test set (MONITOR) across T & R (STA) terminals.	
12b	Put test key in TALK position.	Sidetone heard; Panel lamp lights steadily.
13b	Dial intercom code 27.	Audible signal sounds.
14b	Put test key in MONITOR position.	Sidetone lost; Panel lamp extinguished.
15b	Remove test set from terminals.	
16b	Remove audible signal device.	
17b	Remove strap between TD and R-2 terminals.	(END TEST)



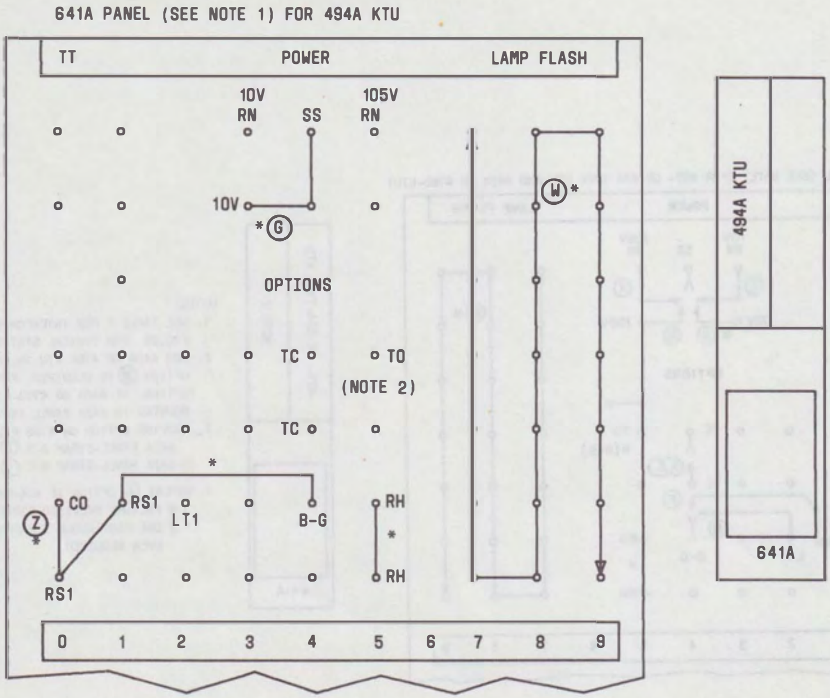
NOTES:

1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. ADD 440A OR 478B KTU IN THIS SLOT IF OPTION (N) IS REQUIRED. REMOVE (Z) OPTION. IF 440A OR 478B KTU MUST BE MOUNTED IN 642A PANEL INSTALL PER FIG. 28.
3. PROVIDE OPTION ON 478B KTU AS FOLLOWS:
   641A PANEL-STRAP A-B (Z)
   642A PANEL-STRAP B-C (Y)
4. REMOVE (F) OPTION IF 424-TYPE KTU IS USED

* FACTORY PROVIDED STRAP

† USE CONTINUOUS STRAPPING METHOD, WHEN REQUIRED.

Fig. 27—Basic Dial Intercom Selector Connections (407- or 424-Type KTU) With Rotary or TOUCH-TONE Dialing (440A or 478B KTU)



NOTES:
1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. FOR 19-CODE INTERCOM, THE DIGIT 1 IS THE TRANSFER DIGIT. NO TRANSFER CODE STRAP IS REQUIRED.

* FACTORY PROVIDED STRAP. OPTIONS Ⓖ AND Ⓦ ARE REQUIRED. OTHER FACTORY PROVIDED STRAPS MAY BE LEFT IN PLACE IF PRESENT.

Fig. 28—Basic Dial Intercom Connections With TOUCH-TONE Selector (494A KTU)

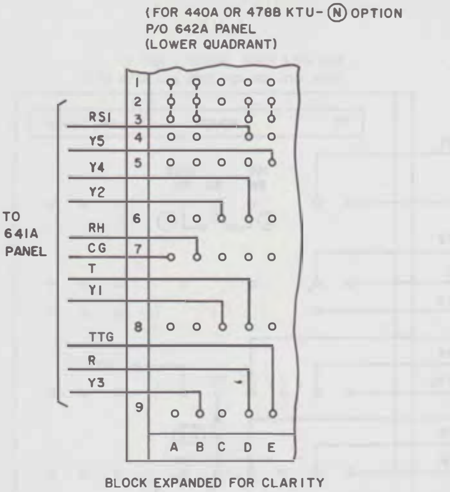
J. ➧494A KTU—TOUCH-TONE Selector (Fig. 28)

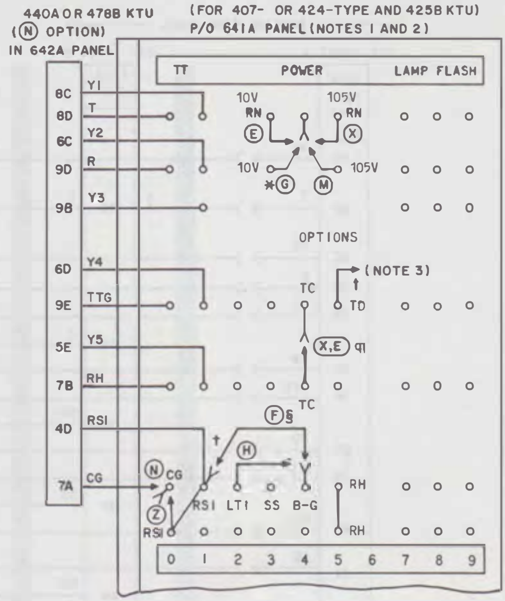
STEP	ACTION	VERIFICATION
1	Place appropriate type audible signal device (bell or buzzer) across RG and R-5 terminals.	
2	Connect tip and ring leads of 2500D, or equivalent, telephone set across T and R (STA) terminals.	
3	Go off-hook.	Sidetone heard; Panel lamp lights steadily.
4	Dial digit 5.	Audible signal sounds.
5	Go on-hook.	Panel lamp extinguished.
6	Move audible signal to RG and R-X5 terminals.	
7	Go off-hook.	Sidetone heard; Panel lamp lights steadily.
8	Dial digit 15.	Audible signal sounds.
9	Go on-hook.	Panel lamp extinguished.
10	Remove audible signal device.	
11	Remove telephone set from terminals.	(END TEST)➧

Functional Designations

5.09 The following list provides functional designations for dial intercom leads and relates them to their function in the system.

BL,BL1,...BLO	STATION BUSY GROUND
BR	SWITCHED B BATTERY
BY1	BUSY GROUND
CG	COUNTER GROUND
D1	OFF-HOOK DETECTION
J	J GROUND
L	LAMP
L1,...LX0	STATION LAMP
LG or MG	LAMP GROUND or MOTOR GROUND
LK	DIAL TONE DISCONNECT
LT1, LT2	LAMP TRANSFER
LX1, LX0	TRANSFERRED STATION LAMP
R1,...RX0	STATION RINGING LEAD
RH	R RELAY HOLD
RN	INTERRUPTED RINGING
RS1	RESET
SS	SIGNAL INPUT
ST	START
TC	B RELAY CONTROL
TD	TRANSFER DIGIT
TTG	TOUCH-TONE GROUND
Y1,...Y5	COUNTER RELAY SELECTION





NOTES:

1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. REMOVE OPTION (W) (FIG. 27) WHEN FURNISHING FLASHING LAMPS.
3. CONNECT TO TERMINAL R(0-9) FOR TRANSFER DIGIT IN 19-STATION INTERCOM. TRANSFER DIGIT CANNOT BE USED AS A SINGLE DIGIT CODE.
4. PROVIDE OPTION (Y) ON 478A KTU IF USED IN 642A PANEL.

* FACTORY PROVIDED STRAP
† USE CONTINUOUS STRAPPING METHOD, WHERE REQUIRED
§ REMOVE (F) OPTION WHEN 424-TYPE KTU IS USED
¶ 425B KTU MUST BE USED TO PROVIDE INTERRUPTED RING

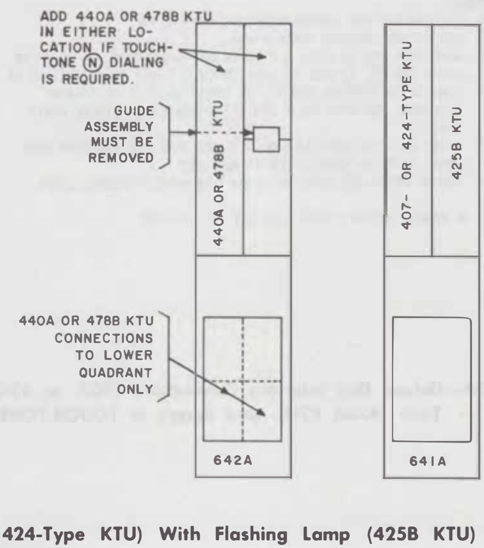
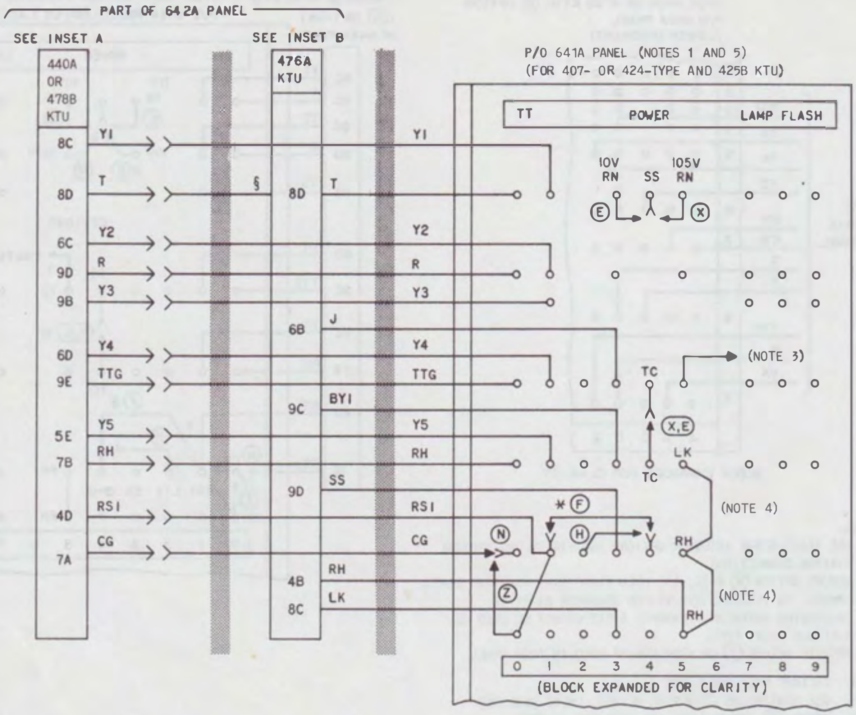


Fig. 29—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU) and Rotary or TOUCH-TONE Dialing (440A or 478B KTU)



NOTES:

1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. WHEN 476A KTU IS USED, ALL POWER OPTIONS EXCEPT THE TC TO TC STRAP FOR (E, X) WILL BE APPLIED ON THE 642A PANEL INSTEAD OF THE 641A PANEL.
3. CONNECT TO TERMINAL R(0-9) FOR TRANSFER DIGIT OF 19-CODE INTERCOM. TRANSFER DIGIT CAN NOT BE USED AS A SINGLE DIGIT CODE.
4. STRAP RH TO LK WHEN 440A OR 478B AND 476A KTU ARE BOTH USED. STRAP RH TO RH WHEN EITHER IS NOT USED.
5. REMOVE OPTION (W) (FIG. 27) WHEN FURNISHING FLASHING LAMPS.

* REMOVE OPTION F WHEN 424-TYPE KTU IS USED.

OPTION STRAPPING ON KTUS

KTU	FEATURES		OPTION	STRAP TERMINALS
476A	DIAL TONE		ZD	1 TO 2
	STA BUSY TONE		ZF	7 TO 8
	RINGBACK TONE	± 110V ± 10V	ZE	4 TO 5
478B	USED IN 642A PANEL		Y	B TO C

Fig. 30—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and Rotary or TOUCH-TONE Dialing (440A or 478B KTU) (Sheet 1 of 2)

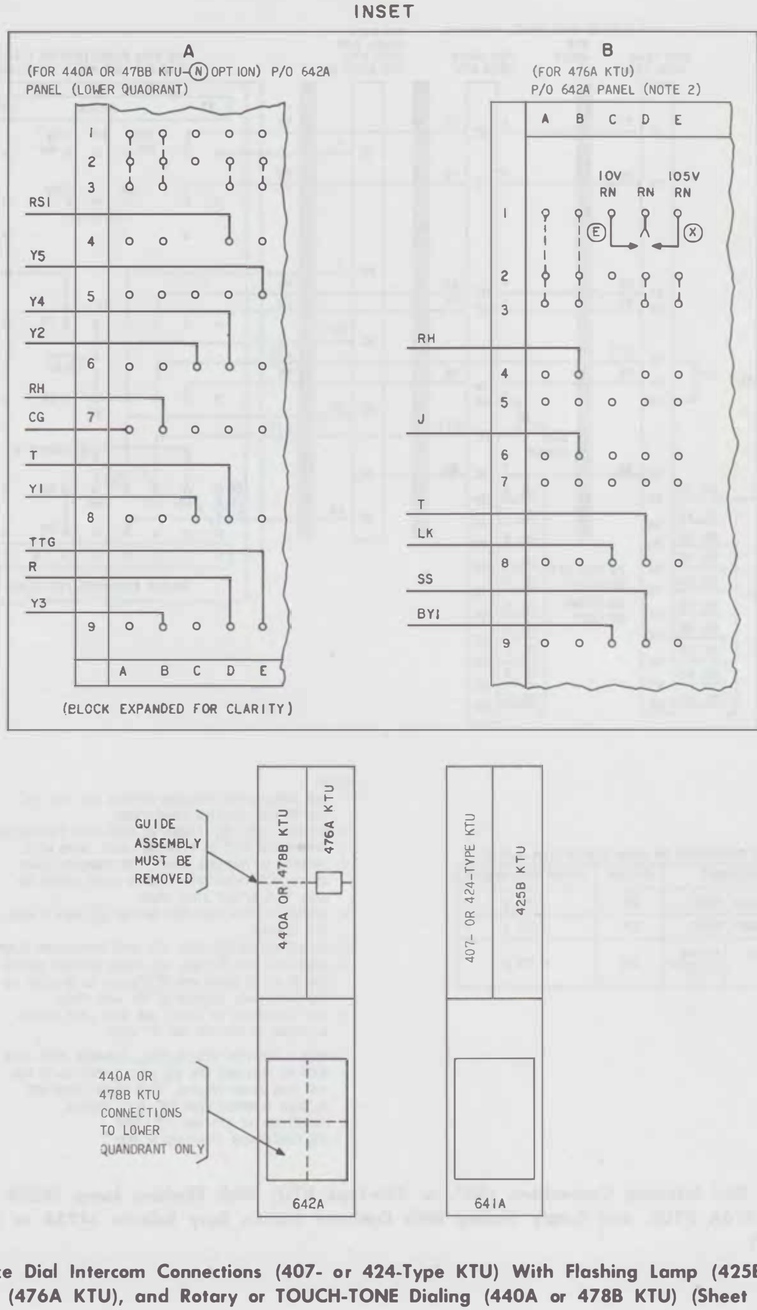
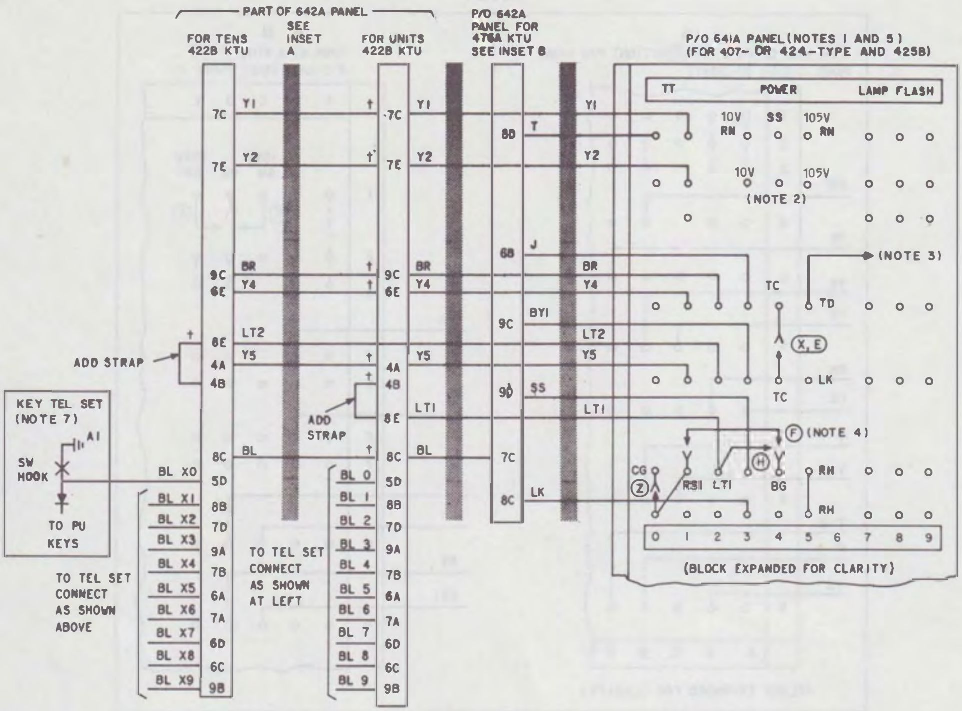


Fig. 30—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and Rotary or TOUCH-TONE Dialing (440A or 478B KTU) (Sheet 2 of 2)



OPTION STRAPPING ON 476A KTU OPTION BLOCK

FEATURES		OPTION	STRAP TERMINALS
DIAL TONE		ZD	1 TO 2
STA BUSY TONE		ZF	7 TO 8
RINGBACK TONE	± 110V + 10V	ZE	4 TO 5

NOTES:

1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. OPTIONS (G), (M) CANNOT BE USED WITH STATION BUSY TONE (476A KTU) OR FLASHING LAMPS (425B KTU).
3. CONNECT TO TERMINAL R(0-9) FOR TRANSFER DIGIT OF 19-CODE INTERCOM. TRANSFER DIGIT CANNOT BE USED AS A SINGLE DIGIT CODE.
4. REMOVE FACTORY FURNISHED OPTION (F) WHEN A 424A KTU IS USED.
5. REMOVE OPTION (W) (FIG. 27) WHEN FURNISHING FLASHING LAMPS.
6. WHEN 476A KTU IS USED, ALL POWER OPTIONS EXCEPT THE TC TO TC STRAP FOR (E,X) WILL BE APPLIED TO THE 642A PANEL INSTEAD OF THE 641A PANEL.
7. FOR CONNECTION OF DIODE, USE BUSY LAMP OPTION AS SHOWN IN SECTION FOR SET USED.

* WHEN A 424-TYPE KTU IS USED, SEPARATE 422B KTUS MUST BE PROVIDED FOR THE UNITS GROUP (0-9) AND THE TENS GROUP (X0-X9). TENS GROUP LEADS ARE BRIDGED (LOOPED) FROM THE UNITS GROUPS, EXCEPTING THE LT1 AND LT2 LEADS.

† USE CONTINUOUS STRAPPING METHOD

Fig. 31—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and Rotary Dialing With Optional Station Busy Selector (422A or B KTU) (Sheet 1 of 2)

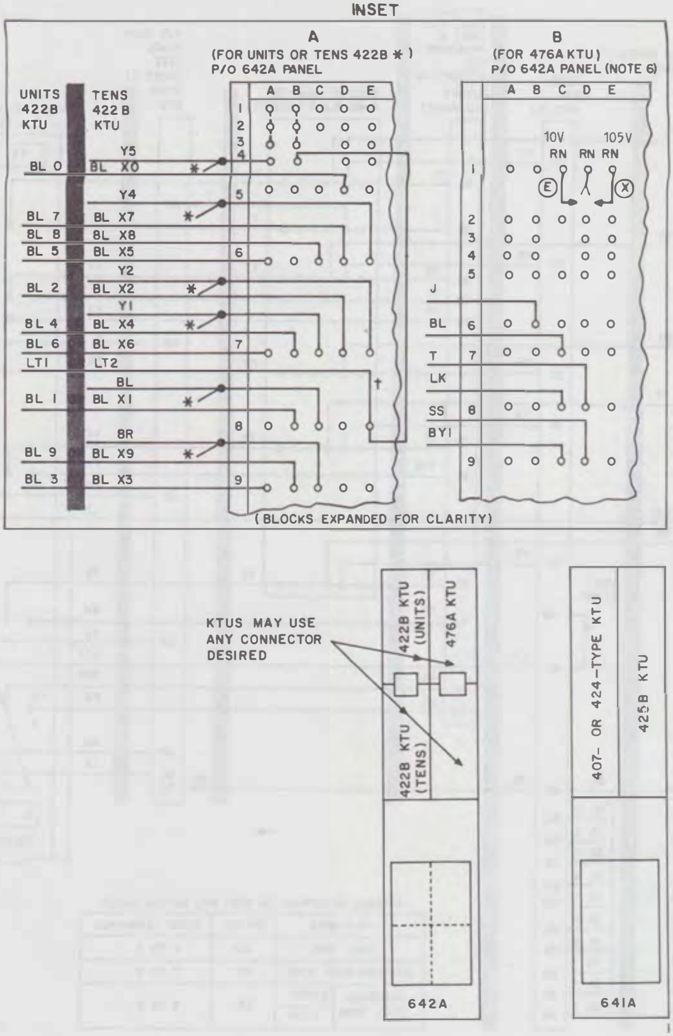
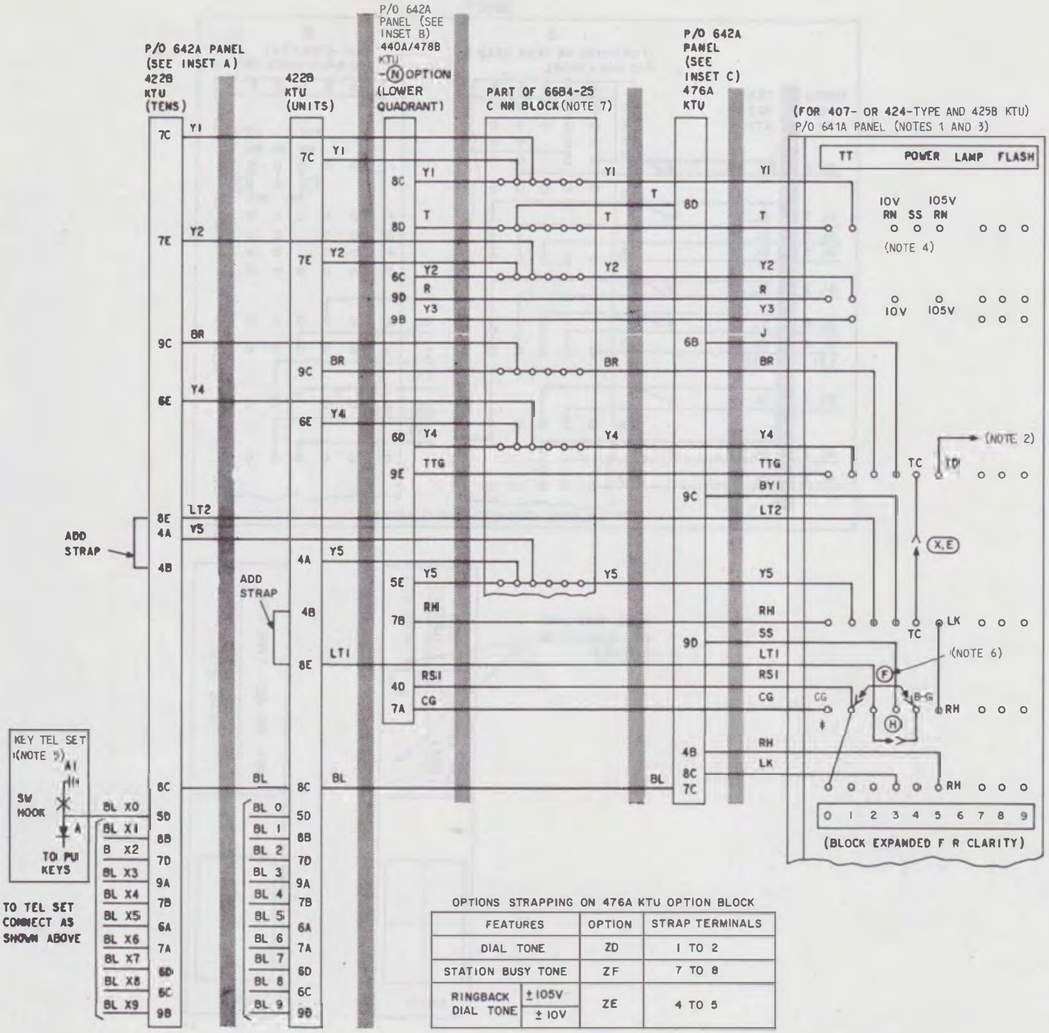


Fig. 31—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and Rotary Dialing With Optional Station Busy Selector (422A or B KTU) (Sheet 2 of 2)

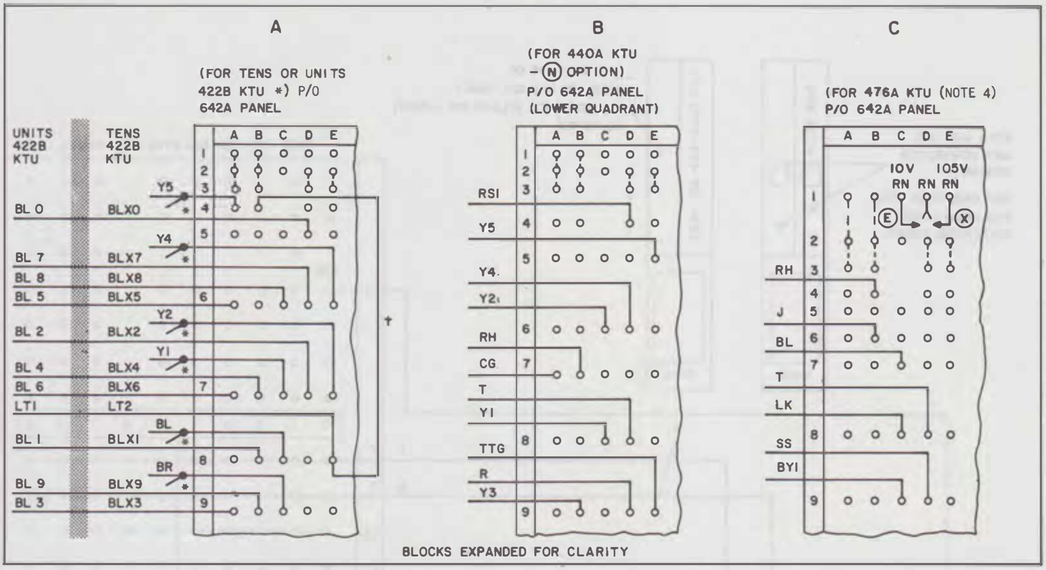


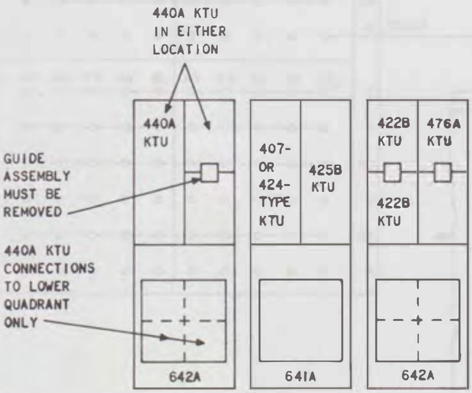
OPTIONS STRAPPING ON 476A KTU OPTION BLOCK

FEATURES		OPTION	STRAP TERMINALS
DIAL TONE		ZD	1 TO 2
STATION BUSY TONE		ZF	7 TO 8
RINGBACK DIAL TONE	±105V	ZE	4 TO 5
	±10V		

Fig. 32—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and TOUCH-TONE Dialing (440A or 478B KTU) With Optional Station Busy Selector (422A or B KTU) (Sheet 1 of 2)

INSET





NOTES:

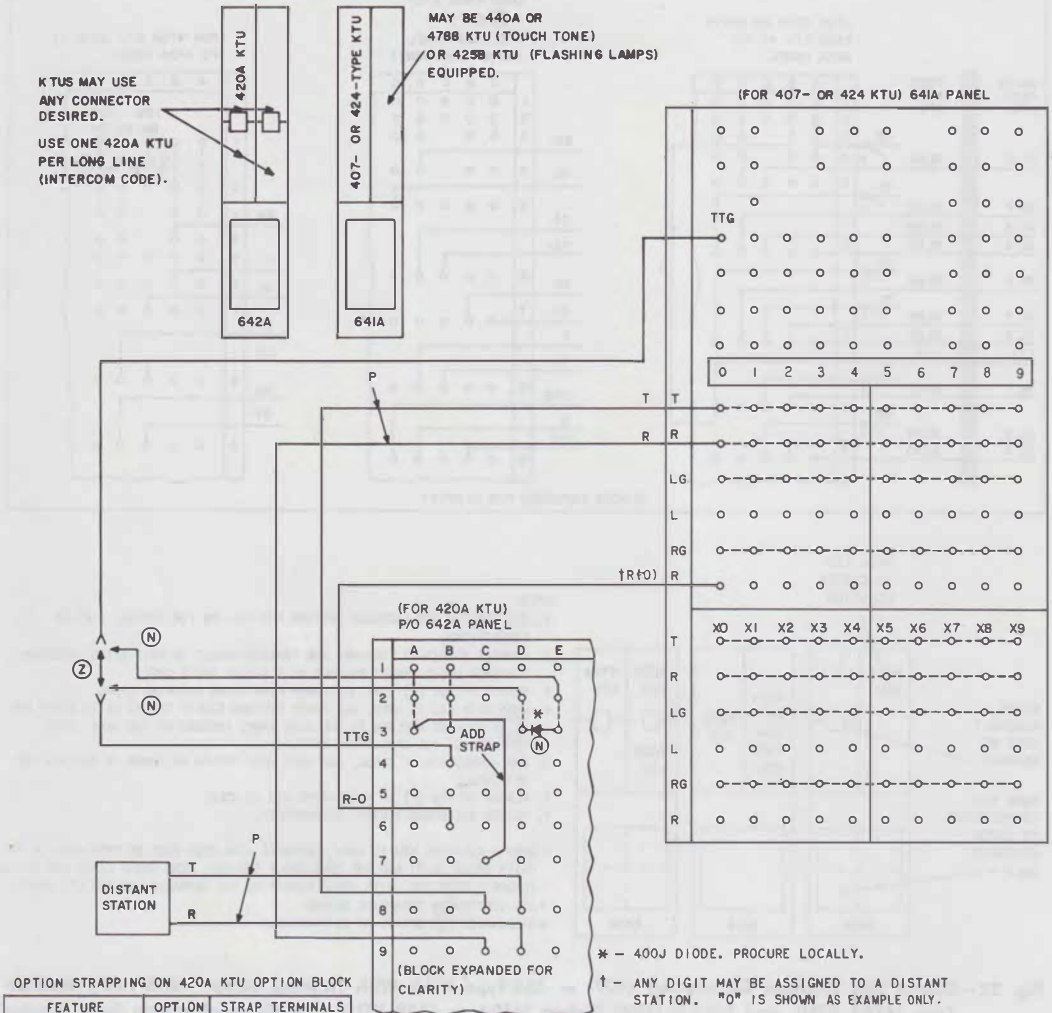
1. SEE TABLE G FOR INTERCOM OPTIONS AND FIG. 26 FOR TYPICAL STATION CONNECTIONS.
2. CONNECT TO R(0-9) TERMINAL FOR TRANSFER DIGIT OF 19-STATION INTERCOM. TRANSFER DIGIT CANNOT BE USED AS A SINGLE DIGIT CODE.
3. REMOVE OPTION (W) (FIG. 27) WHEN FURNISHING FLASHING LAMPS.
4. WHEN 476A KTU IS USED, ALL POWER OPTIONS EXCEPT THE TC TO TC STRAP FOR (E,X) WILL BE APPLIED TO THE 642A PANEL INSTEAD OF THE 641A. BOTH PANELS MUST USE SAME POWER SUPPLY.
5. FOR CONNECTION OF DIODE, USE BUSY LAMP OPTION AS SHOWN IN SECTION FOR SET USED.
6. REMOVE OPTION (F) IF A 424-TYPE KTU IS USED.
7. YELLOW BACKBOARD (185A1) RECOMMENDED.

* WHEN A 424-TYPE KTU IS USED, SEPARATE 422B KTUS MUST BE PROVIDED FOR THE UNITS GROUP (0-9) AND THE TENS GROUP (X0-X9). TENS GROUP LEADS ARE BRIDGED (LOOPED) FROM THE UNITS GROUP EXCEPTING THE SEPARATE LT1 AND LT2 LEADS.

† USE CONTINUOUS STRAPPING METHOD

✱ DISCONNECT (Z) OPTION AT CG TERMINALS

Fig. 32—Deluxe Dial Intercom Connections (407- or 424-Type KTU) With Flashing Lamp (425B KTU), Audible Tone (476A KTU), and TOUCH-TONE Dialing (440A or 478B KTU) With Optional Station Busy Selector (422A or B KTU) (Sheet 2 of 2)



OPTION STRAPPING ON 420A KTU OPTION BLOCK

FEATURE		OPTION	STRAP TERMINALS
AUDIBLE SIGNALS	10 VAC	E OR G	1 TO 4, 7 TO 8
	-24 VDC	K	
	110V 30 HZ	X OR M	2 TO 4, 7 TO 8

Fig. 33—Long Line (420A KTU) Option for Basic or Deluxe Dial Intercom

K. 420A KTU—Long Line Circuit (Fig. 33)

STEP	ACTION	VERIFICATION
1	Place 1013A, or equivalent, test set (MONITOR) across T & R (DISTANT END) terminals.	
2	Put test key in TALK position.	Sidetone heard.
3	Put test key in MONITOR position.	Sidetone lost.
4	Remove test set from T & R (DISTANT END) terminals.	(END TEST)

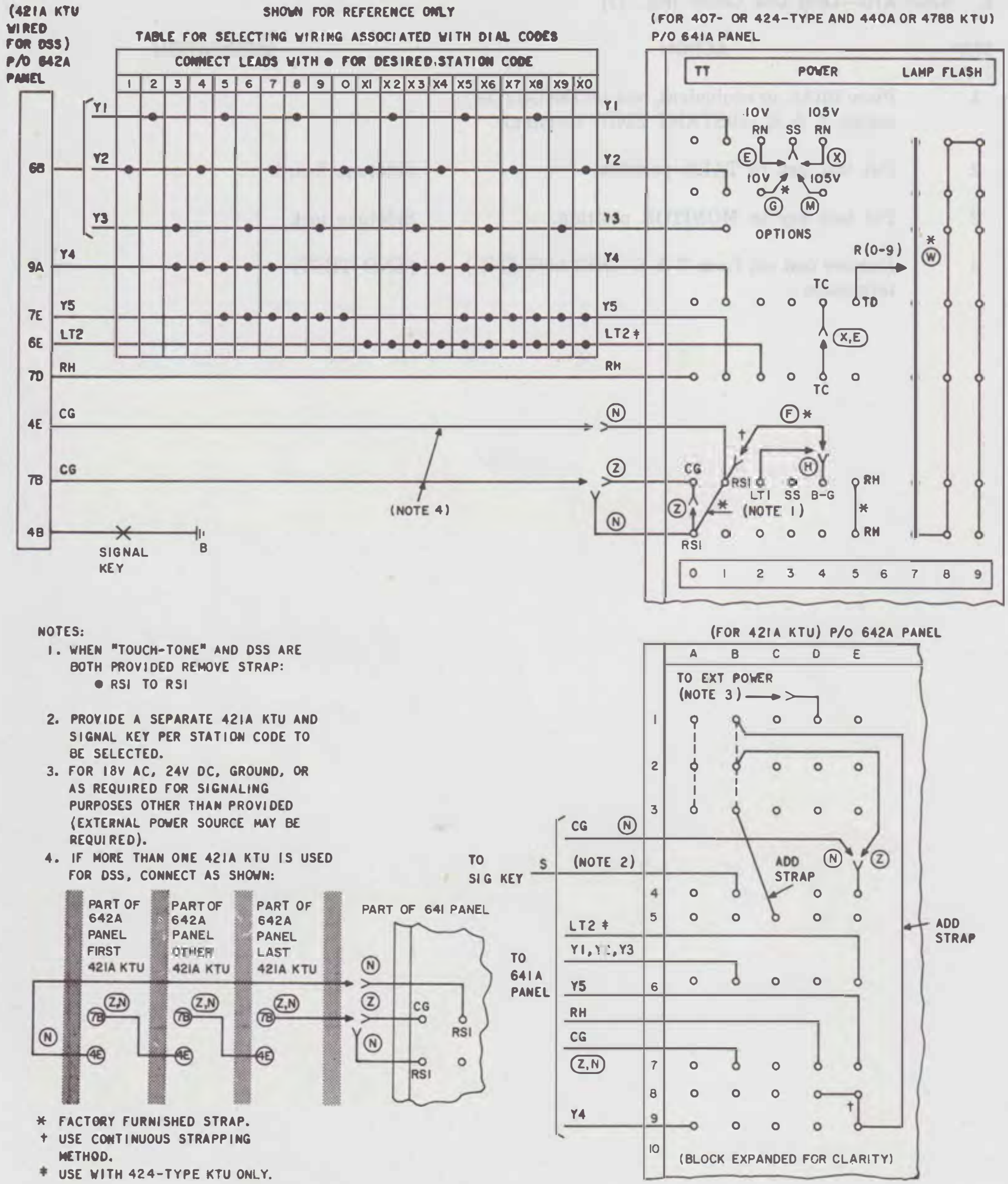


Fig. 34—Direct Station Selection Option (421A KTU in 642A Panel) for Basic or Deluxe Dial Intercom (Sheet 1 of 2)

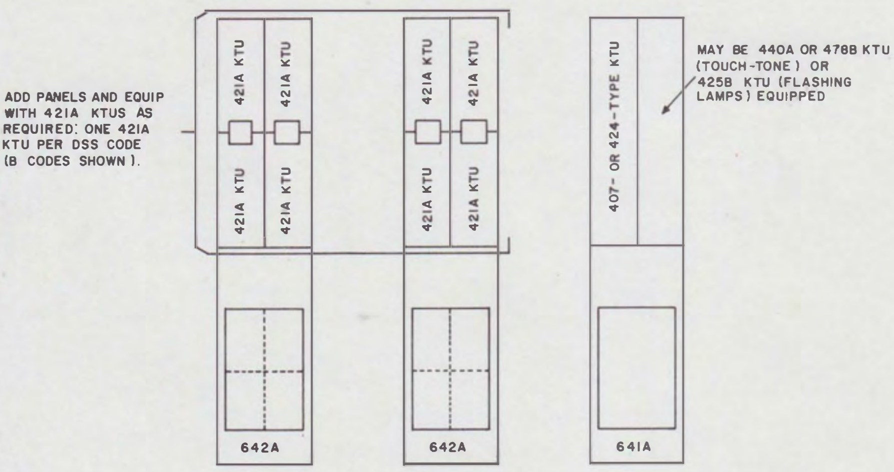
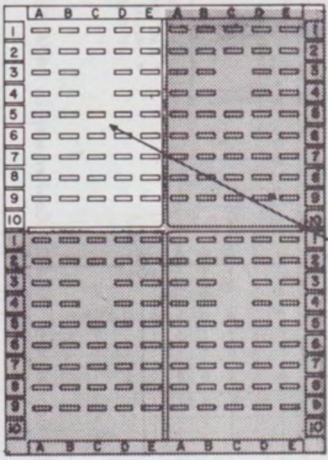
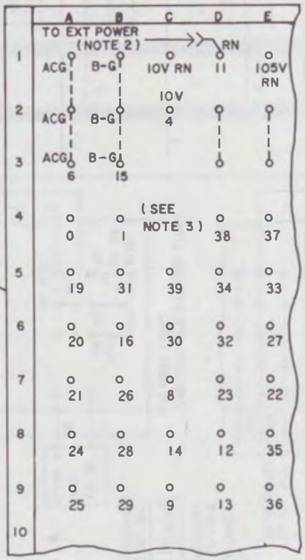


Fig. 34—Direct Station Selection Option (421A KTU in 642A Panel) for Basic or Deluxe Dial Intercom (Sheet 2 of 2)



(NOTES 1 AND 2)



NOTES:

1. TERMINAL FIELD IS DIVIDED INTO QUADRANTS. TYPICAL QUADRANT (1A) SHOWN HERE AND IN FOLLOWING 642A OR 642AR MODULAR PANEL CORRECTIONS FIGURES.
2. FOR 18V AC, 24V DC, GROUND OR AS REQUIRED FOR SIGNALING PURPOSES OTHER THAN PROVIDED (EXTERNAL POWER SOURCE MAY BE REQUIRED).
3. TERMINAL NUMBERS RELATE TO PINS ON 914B CONNECTOR.

914B CONNECTOR
PIN NUMBERING

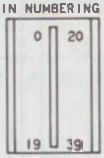
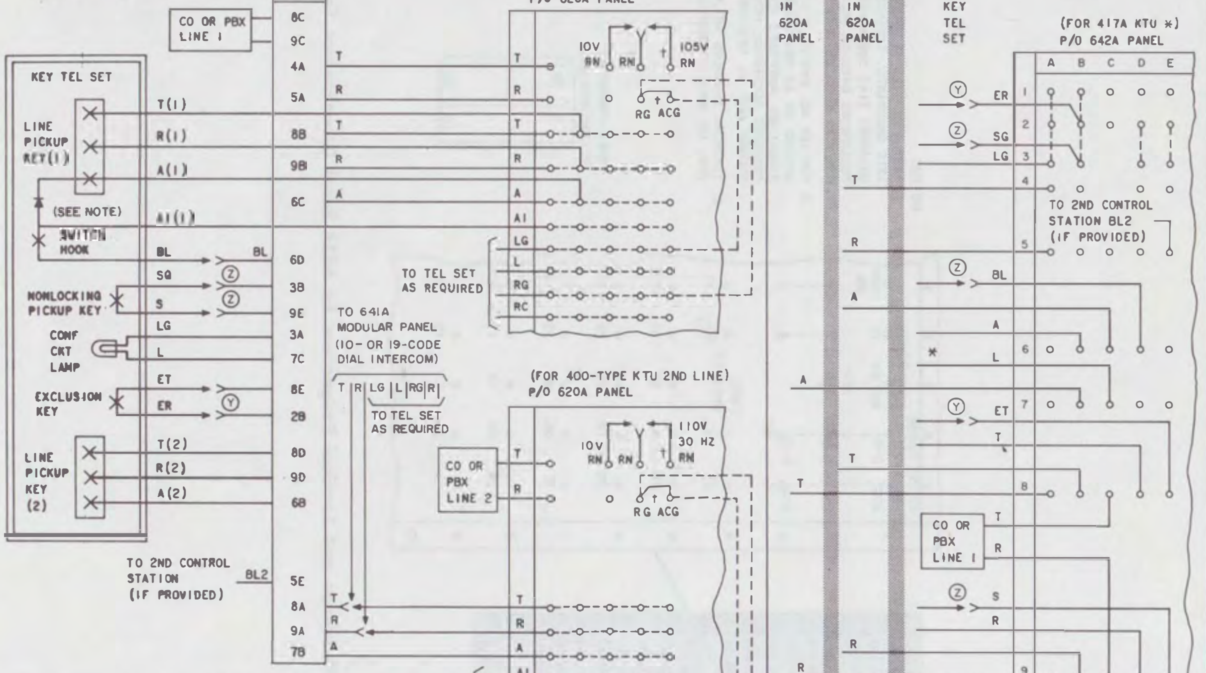


Fig. 35—Terminal Field Illustration and Terminal Designations for 642A Panel (Miscellaneous Services)

NOTE:
DIODE MUST BE INSTALLED IN "A" LEAD OF TEL SET WHEN CONFERENCE CIRCUIT IS CONTROLLED BY A NON-LOCKING KEY. FOR METHOD OF CONNECTION, USE STATION BUSY OPTION AS SHOWN IN CONNECTION SECTION OF TYPE SET USED.



OPTION STRAPPING ON 417A KTU OPTION BLOCK

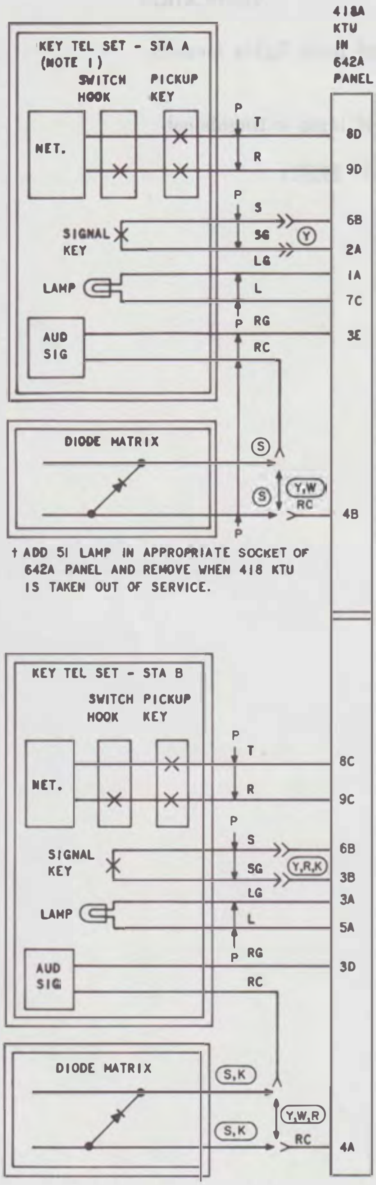
FEATURES		KTU OPTION	STRAP TERMINALS
ONE STATION	CONTROLLED BY NONLOCKING KEY	X	6 TO 10
TWO STATIONS	CONTROLLED BY NONLOCKING KEY	W ǂ	4 TO 6, 8 TO 10 (diodes)
CONTROLLED BY EXCLUSION KEY		Y	3 TO 5
CONTROLLED BY NONLOCKING KEY		Z	1 TO 2

--- FACTORY FURNISHED WIRING
† FACTORY FURNISHED STRAP
ǂ INSTALL KS-15724, L1 DIODES OR EQUIVALENT BETWEEN TERMINALS AS SHOWN

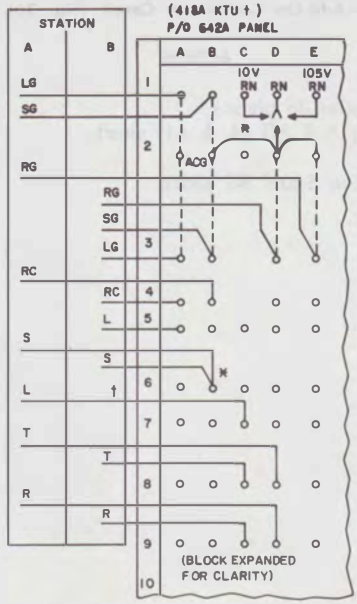
Fig. 36—417A KTU Connections (Add-On Conference) in 642A Panel

L. 417A KTU—Add-On Conference Circuit (Fig. 36)

STEP	ACTION	VERIFICATION
1	(Z option in place.) Apply S & SG (A & A1) short.	Panel lamp lights steadily.
2	Remove S and SG short.	Panel lamp extinguished.
		(END TEST)



† ADD 51 LAMP IN APPROPRIATE SOCKET OF 642A PANEL AND REMOVE WHEN 418 KTU IS TAKEN OUT OF SERVICE.



NOTES: ————FACTORY FURNISHED WIRING

1. STATION "A" IS ALWAYS ASSIGNED AS THE AUTOMATIC SIGNALING STATION WHENEVER THE ONE-WAY AUTOMATIC, ONE-WAY MANUAL SIGNALING OPTION IS USED.
2. THESE OPTIONS APPLY TO THE SIGNAL KEY AND AUDIBLE SIGNAL AT STA "B" ONLY. THE AUDIBLE SIGNAL AT STA "A" IS UNDER CONTROL OF RELAY "S". THE AUDIBLE SIGNAL AT STA "A" MAY BE PART OF A COMMON AUDIBLE ARRANGEMENT PROVIDED THE DIODE MATRIX IS USED FOR CONTROL.
3. THE AUDIBLE SIGNALS AT STA "A" AND "B" MAY BE PART OF A COMM AUD ARRANGEMENT PROVIDED THE DIODE MATRIX IS USED FOR CONTROL.

* USE CONTINUOUS METHOD OF STRAPPING, WHEN REQUIRED.

OPTION STRAPPING ON 418A KTU OPTION BLOCK

FEATURES				OPTION	STRAP TERMINAL
AUDIBLE SIGNALS	TWO-WAY AUTOMATIC	INTERRUPTED	WITHOUT DIODE MATRIX CONTROL	W	2 TO 3 TO 4 *
			WITH DIODE MATRIX CONTROL	S	
	ONE-WAY AUTOMATIC ONE-WAY MANUAL (NOTE 2)		WITHOUT DIODE MATRIX CONTROL	R	3 TO 4
			WITH DIODE MATRIX CONTROL	K	
	TWO-WAY MANUAL (NOTE 3)			Y	
AUDIBLE RING-BACK	TWO-WAY AUTOMATIC			Q	9 TO 10, 5 TO 7 TO 8 *
	ONE-WAY AUTOMATIC, ONE-WAY MANUAL			H	5 TO 7, 9 TO 10
	TWO-WAY MANUAL			M	9 TO 10

Fig. 37—418A KTU Connections (Short Range, DC Signaling, Private Line) in 642A Panel

M. 418A KTU—Short Range, DC Signaling, Private Line (Fig. 37)

STEP	ACTION	VERIFICATION
1	Place ringer across RG2 & RC2 (STA B) terminals.	
2	Place 1013A or equivalent, test set (MONITOR) across T & R (STA A).	
3	Put test key in TALK position.	Sidetone heard; Panel lamp (STA A) lights steadily. Ringer (STA B) sounds (interrupted).
4	Apply S & SG/A (A & A1) short (STA A).	Ringer (STA B) sounds (steady).
5	Remove S & SG short (STA A).	Ringer (STA B) sounds (interrupted).
6	Put test set in MONITOR position.	Sidetone lost; Panel lamp (STA A) extinguished. Ringer (STA B) silenced.
7	Move ringer from RG2 & RC2 (STA B) terminals to RG1 & RC1 (STA A) terminals.	
8	Move test set from T & R (STA A) terminals to T & R (STA B).	
9	Put test key in TALK position.	Sidetone heard. Ringer (STA A) sounds (interrupted). Panel lamp (STA A) flashes.
10	Apply S & SG (A & A1) short (STA B).	Ringer (STA A) sounds (steady).
11	Remove S & SG short (STA B).	Ringer (STA A) sounds (interrupted). Panel lamp (STA A) flashes.
12	Apply T & R (STA A) short.	Ringer (STA A) silenced. Panel lamp (STA A) lights steadily.
13	Put test key in MONITOR position.	Sidetone lost.
14	Remove test set from T & R (STA B) terminals.	
15	Remove ringer from RG1 & RC1 terminals.	(END TEST)

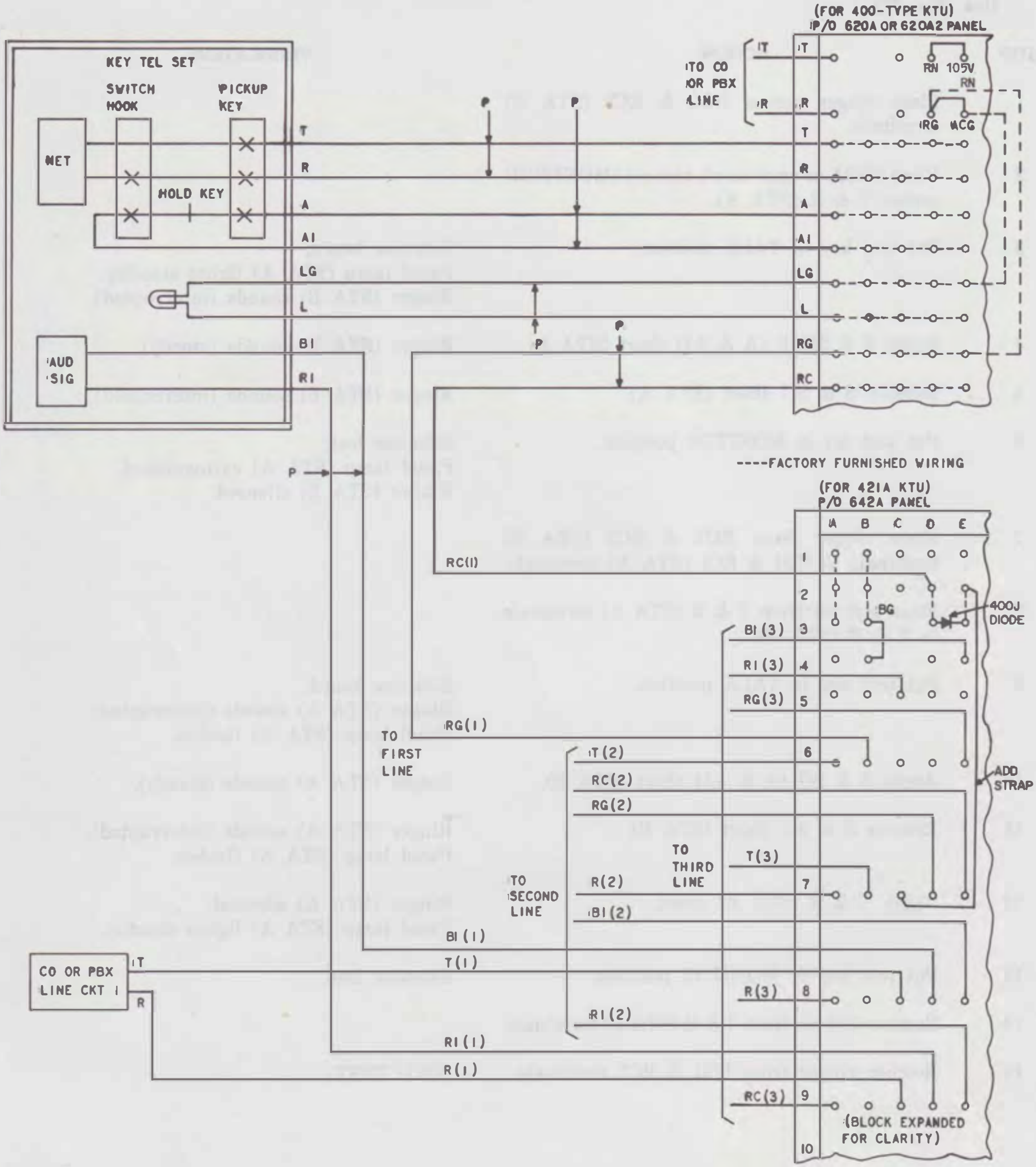
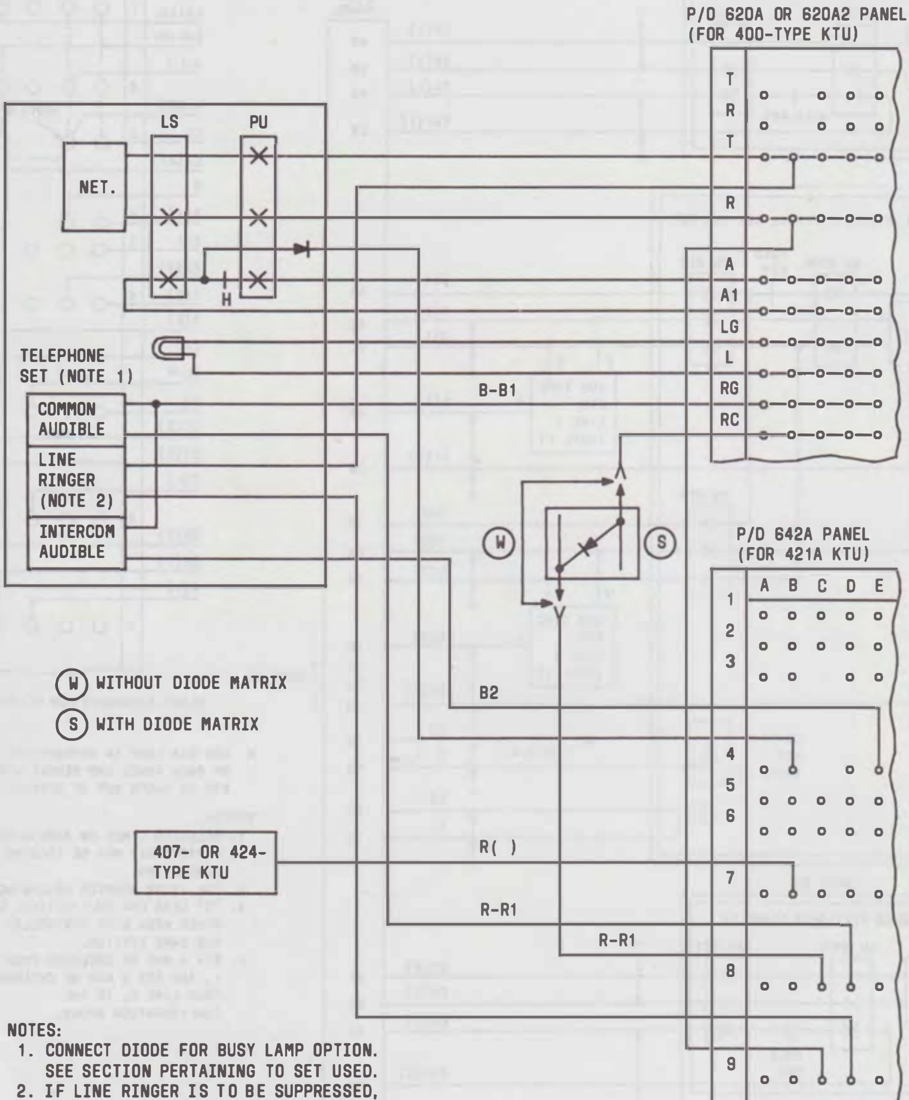


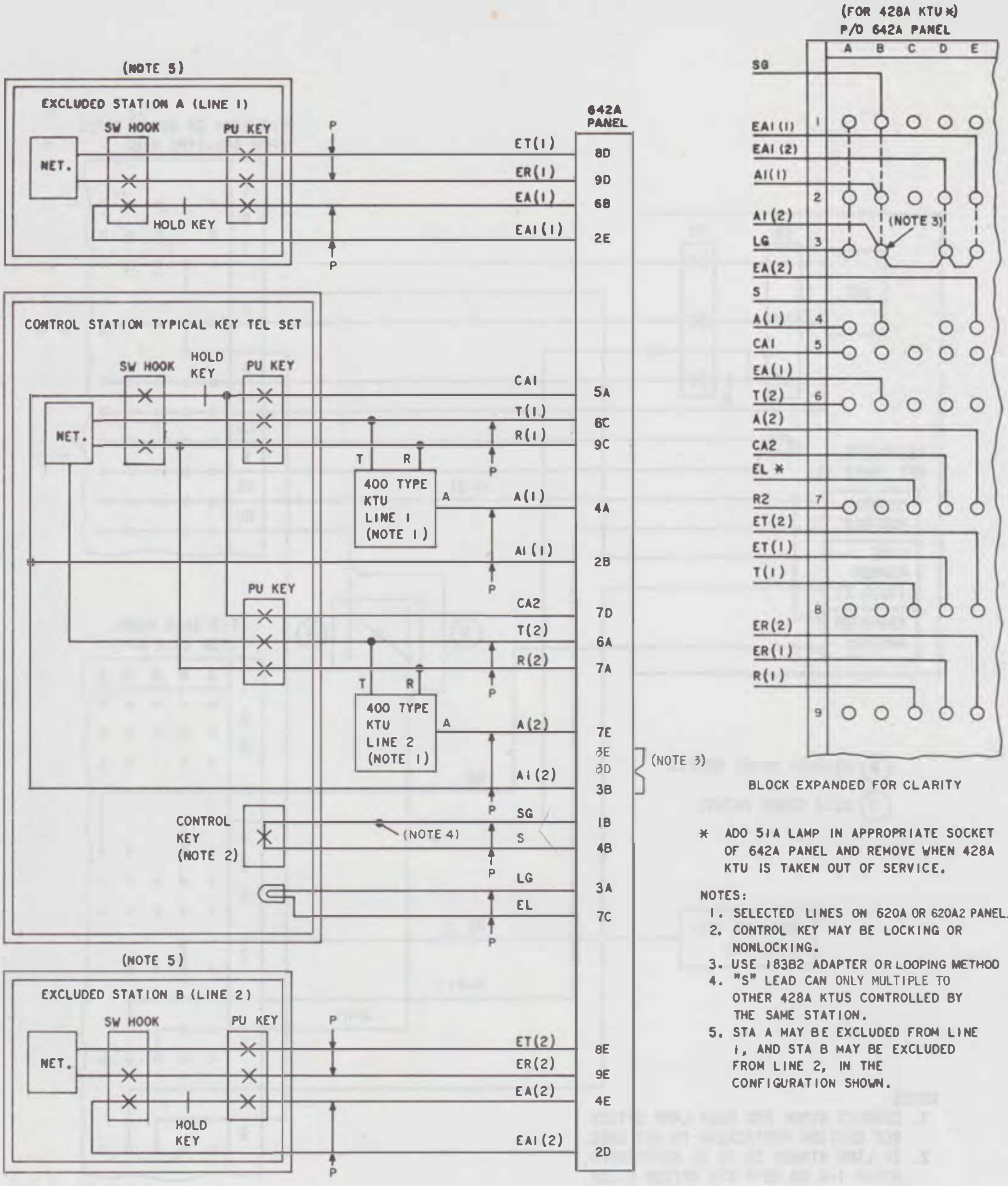
Fig. 38—421A KTU Connections (Power Failure Transfer) in 642A Panel



NOTES:

1. CONNECT DIODE FOR BUSY LAMP OPTION. SEE SECTION PERTAINING TO SET USED.
2. IF LINE RINGER IS TO BE SUPPRESSED, STRAP 1-2 ON 421A KTU OPTION BLOCK.

Fig. 39—421A KTU Connections (Audible Signal Suppression) in 642A Panel



* ADD 51A LAMP IN APPROPRIATE SOCKET OF 642A PANEL AND REMOVE WHEN 428A KTU IS TAKEN OUT OF SERVICE.

NOTES:

1. SELECTED LINES ON 620A OR 620A2 PANEL.
2. CONTROL KEY MAY BE LOCKING OR NONLOCKING.
3. USE 183B2 ADAPTER OR LOOPING METHOD
4. "S" LEAD CAN ONLY MULTIPLE TO OTHER 428A KTUS CONTROLLED BY THE SAME STATION.
5. STA A MAY BE EXCLUDED FROM LINE 1, AND STA B MAY BE EXCLUDED FROM LINE 2, IN THE CONFIGURATION SHOWN.

Fig. 40—428A KTU Connections (Multiline Exclusion) in 642A Panel

NOTES:

1. FOR I HOLD, THE A AND L LEADS FROM THE TEL SET SELECTED FOR I HOLD CONNECT THROUGH THE 429B KTU TO THE 400D KTU. THE A AND L LEADS FROM THE OTHER TEL SETS CONN DIRECTLY TO THE 400D KTU.
2. FOR PRIORITY HOLD, THE A AND L LEADS FROM EACH TEL SET CONNECT THROUGH THE 429B KTU TO THE 400-TYPE KTU.
3. THE 429B KTU WILL PROVIDE SUPPLEMENTARY HOLD FOR TWO CO OR PBX LINE CIRCUITS. EACH HOLD CKT MAY BE ASSIGNED AS PRIORITY OR I HOLD.
4. LIMITATIONS OF THE 430A KTU ARE AS FOLLOWS:
   A. FL1 OR FL2 LEAD CAN SERVE A MAXIMUM OF 50 LAMPS.
   B. SP LEAD CAN CONN TO A MAXIMUM OF 20 STATIONS.

* – TO MESSAGE REGISTER IF PROVIDED
† – I HOLD
‡ – PRIORITY HOLD
§ – MAY REQUIRE CONTINUOUS STRAPPING METHOD

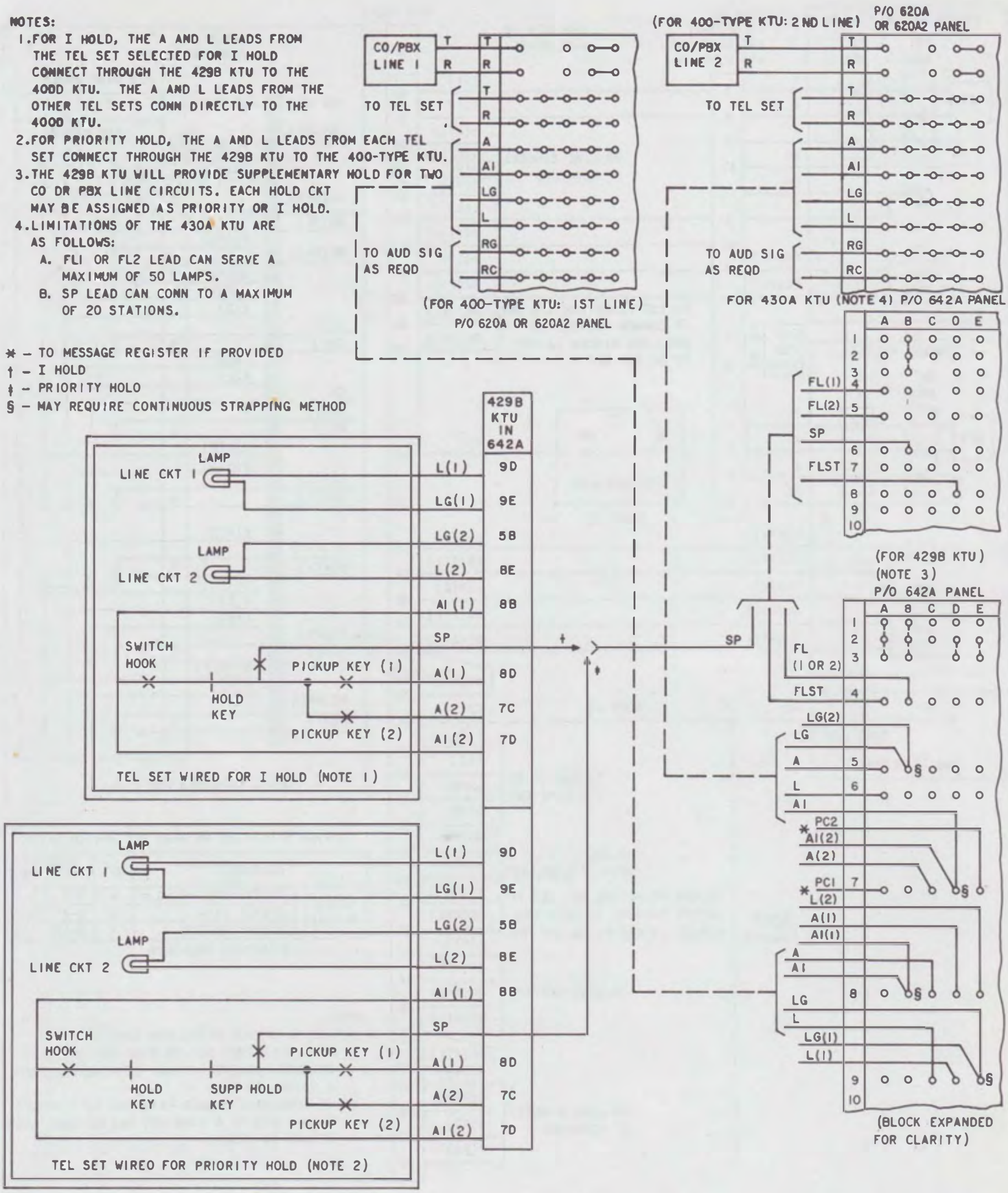
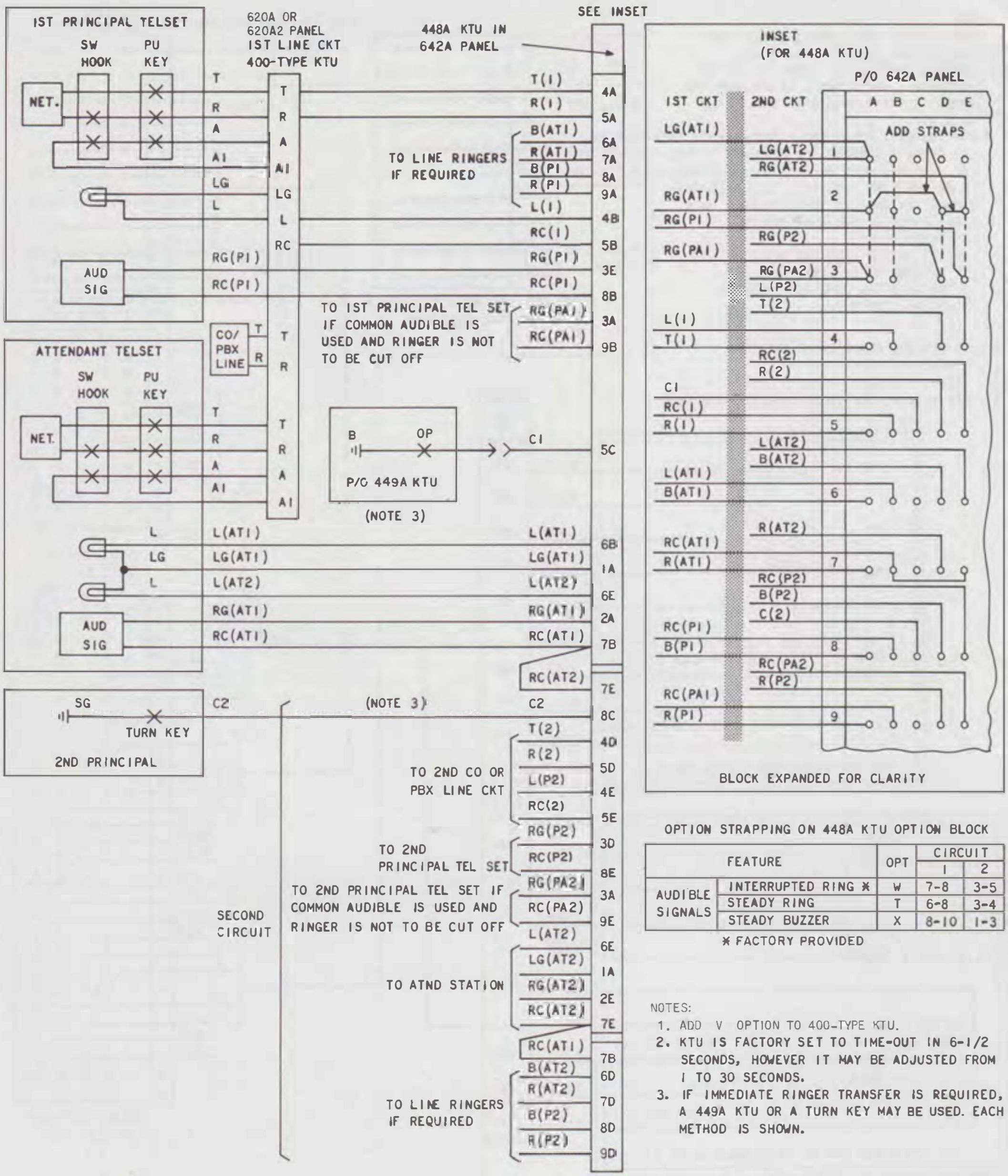


Fig. 41—429B KTU Connections (Supplementary Hold Detector) and 430A KTU (Flutter Generator) in 642A Panel



OPTION STRAPPING ON 448A KTU OPTION BLOCK

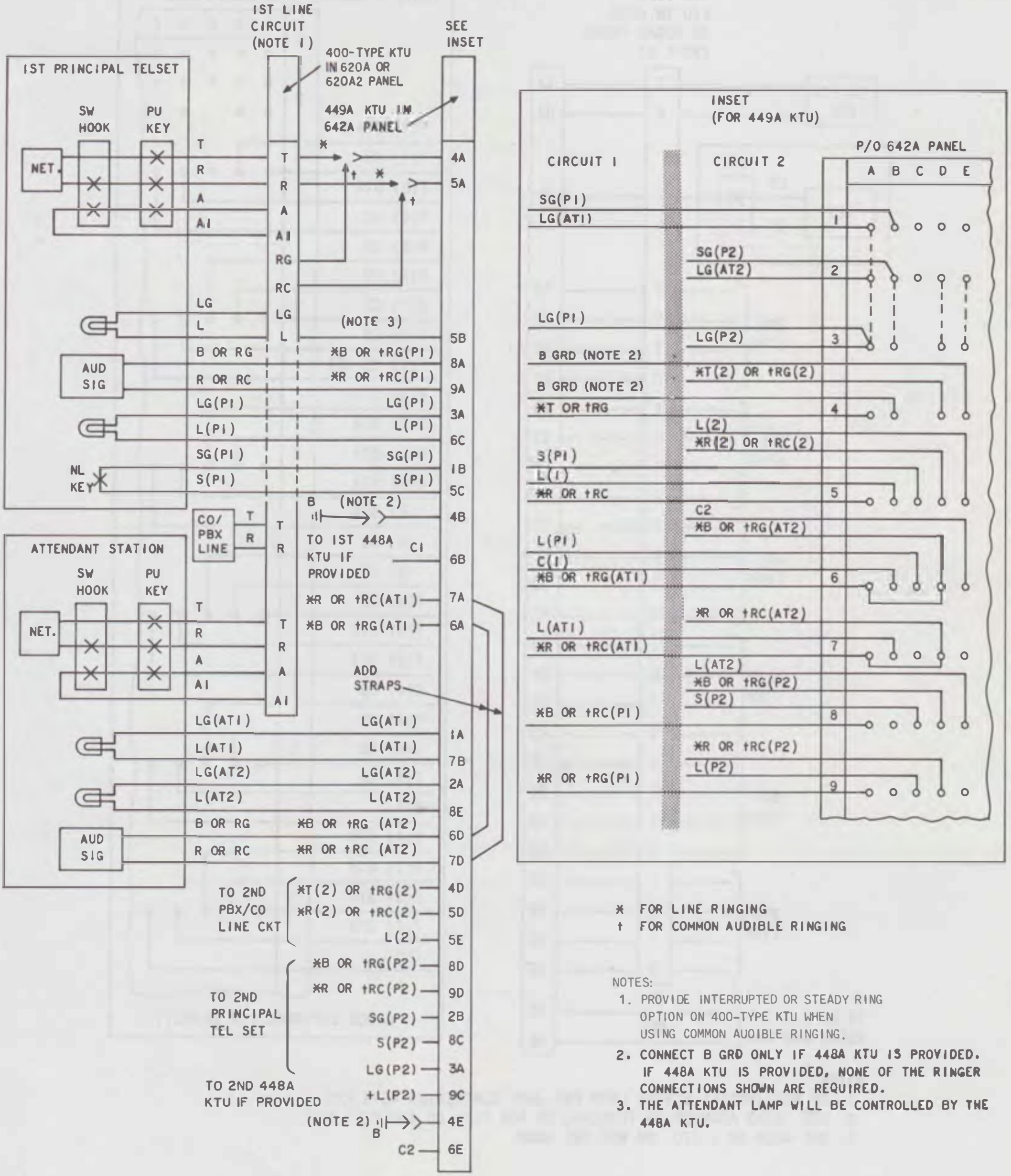
FEATURE		OPT	CIRCUIT 1	CIRCUIT 2
AUDIBLE SIGNALS	INTERRUPTED RING *	W	7-8	3-5
	STEADY RING	T	6-8	3-4
	STEADY BUZZER	X	8-10	1-3

* FACTORY PROVIDED

NOTES:

1. ADD V OPTION TO 400-TYPE KTU.
2. KTU IS FACTORY SET TO TIME-OUT IN 6-1/2 SECONDS, HOWEVER IT MAY BE ADJUSTED FROM 1 TO 30 SECONDS.
3. IF IMMEDIATE RINGER TRANSFER IS REQUIRED, A 449A KTU OR A TURN KEY MAY BE USED. EACH METHOD IS SHOWN.

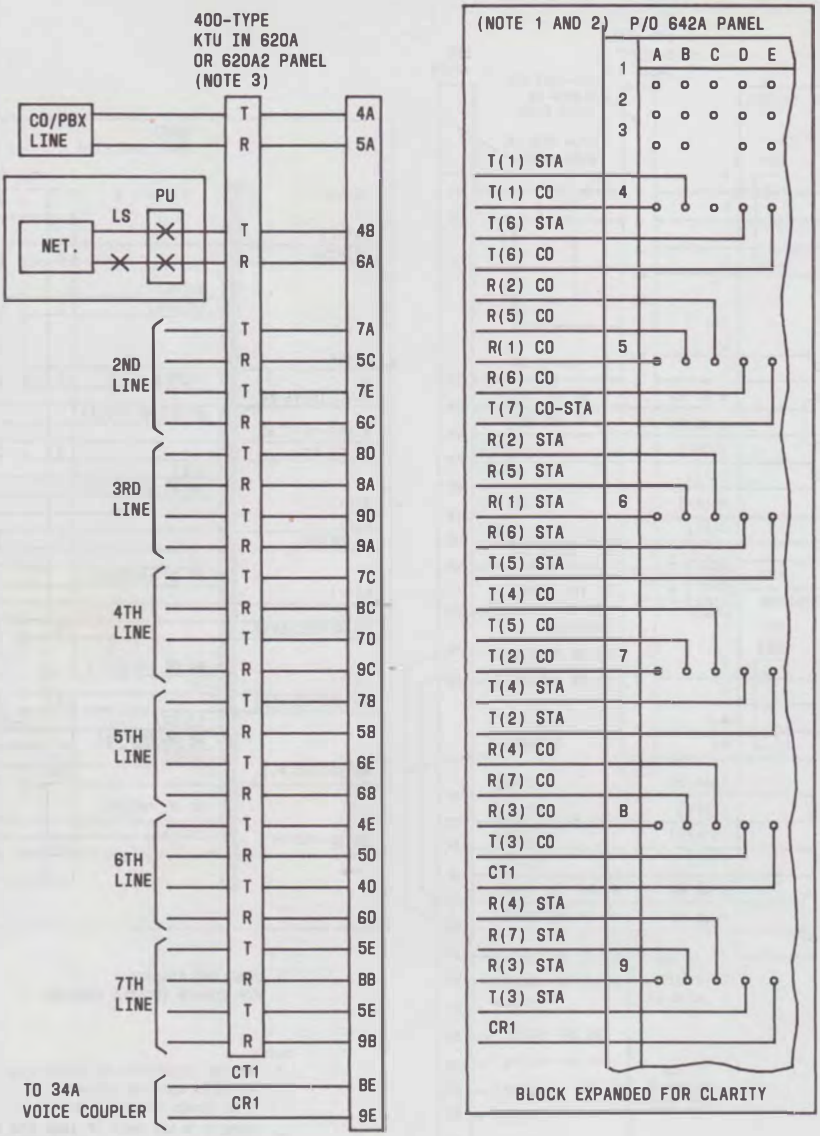
Fig. 42—448A KTU Connections (Variable Delay Timer) in 642A Panel



* FOR LINE RINGING
† FOR COMMON AUDIBLE RINGING

NOTES:
1. PROVIDE INTERRUPTED OR STEADY RING OPTION ON 400-TYPE KTU WHEN USING COMMON AUDIBLE RINGING.
2. CONNECT B GRD ONLY IF 448A KTU IS PROVIDED. IF 448A KTU IS PROVIDED, NONE OF THE RINGER CONNECTIONS SHOWN ARE REQUIRED.
3. THE ATTENDANT LAMP WILL BE CONTROLLED BY THE 448A KTU.

Fig. 43—449A KTU Connections (Immediate Transfer Control) in 642A Panel



NOTES:

1. DO NOT INSTALL STATUS LAMP FOR JACK CONTAINING 451B KTU
2. USE 1B3A2 ADAPTER ON TERMINAL 5E FOR T(7) CO AND T(7) STA
3. USE 400D OR G KTU. DO NOT USE 400H

Fig. 44—♦451B KTU Connections (Music-On-Hold) in 642A Panel♦

NOTES:

1. MAKE CONNECTIONS IN TOP LEFT QUADRANT OF TERMINAL FIELD IF 479B KTU IS IN CONNECTOR 1A/1B OR TO TOP RIGHT QUADRANT IF KTU IS IN CONNECTOR 2A/2B.
2. MAKE CONNECTIONS TO QUADRANT IN 620A OR 620A2 PANEL CORRESPONDING TO CONNECTOR HOLDING 400-TYPE KTU.
3. TERMINAL NUMBERS RELATE TO PINS ON CONNECTOR.
4. REMOVE GUIDE ASSEMBLY BETWEEN UPPER AND LOWER CONNECTORS HOLDING 479B KTU.
5. REFER TO SECTION 518-215-401 FOR INFORMATION ON PLACEMENT OF OPTION PLUGS ON 479B KTU AND 107A AND 107B CIRCUIT MODULES.

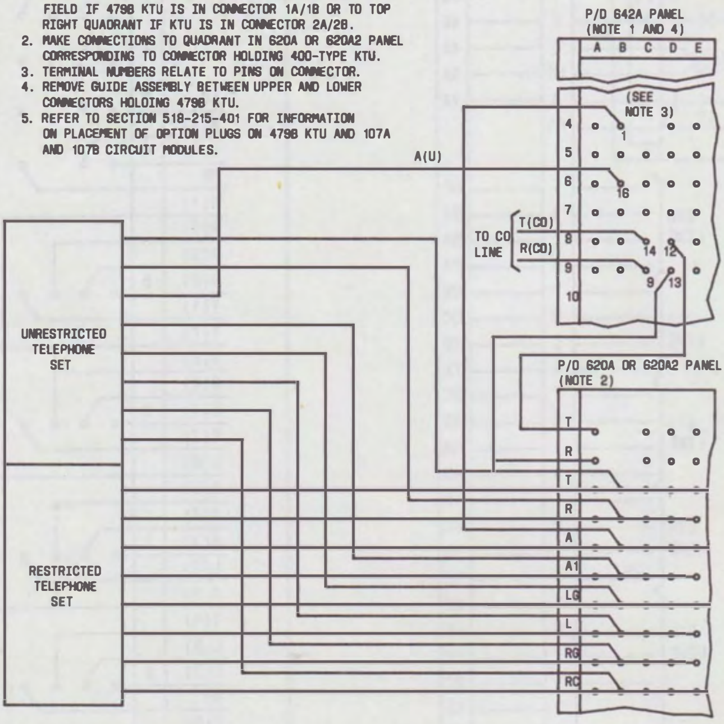
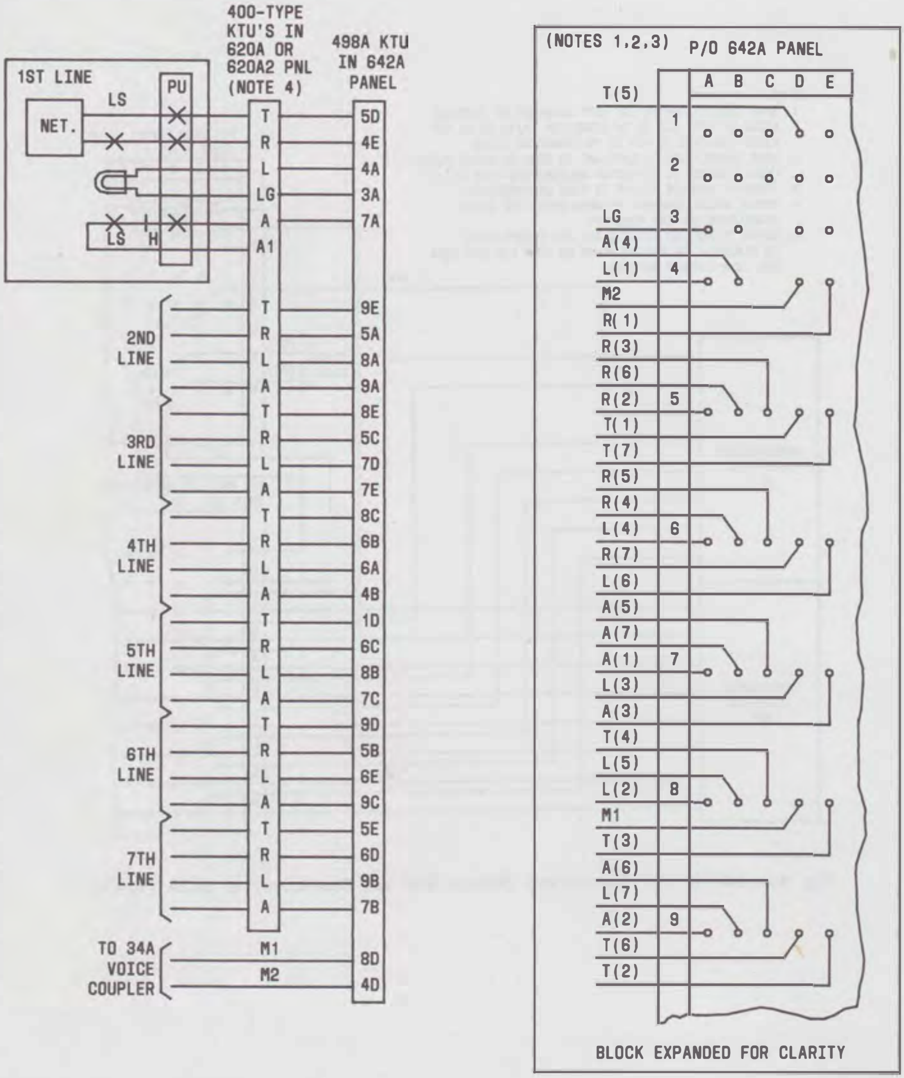


Fig. 45—479B KTU Connections (Rotary Dial Toll Restriction) in 642A Panel



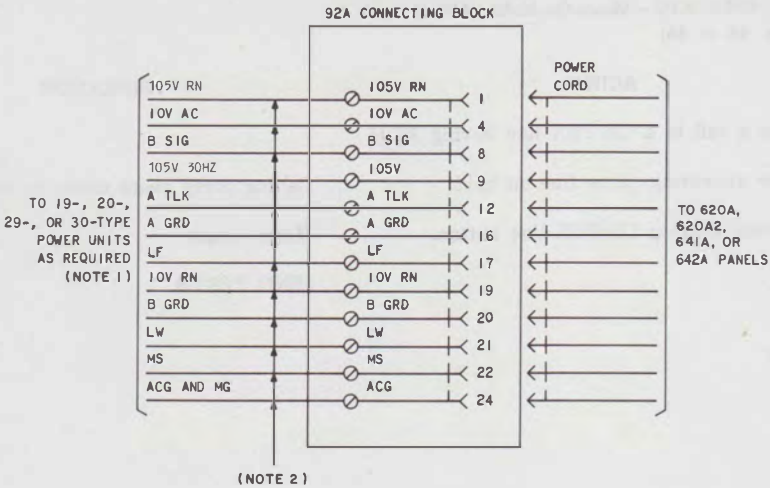
NOTES:

1. EACH 498A KTU CONTAINS FOUR CIRCUITS. TO INCREASE CAPACITY TO SEVEN, ADD 116A1 CM.
2. DO NOT CONNECT ANY SIGNAL VOLTAGE TO TERMINAL 10 OF QUADRANT CONTAINING 498A KTU.
3. DO NOT INSTALL STATUS LAMP FOR JACK CONTAINING 498A KTU.
4. USE A 4000, G, OR H KTU.

Fig. 46—▶498A KTU Connections (Music-On-Hold) in 642A Panel◀

N. ◆451B or 498A KTU—Music-On-Hold (MOH) Circuit (Fig. 44 or 46)

STEP	ACTION	VERIFICATION
1	Place a call to a CO/PBX line having MOH.	
2	After answering, place line on hold.	Calling party hears music in receiver.
3	Depress winking CO/PBX line button.	Music ceases.
		(END TEST)◆



NOTES:
1. INTERRUPTED VOLTAGES, WHEN REQUIRED MUST BE SUPPLIED THROUGH AN INTERRUPTER.
2. REFER TO 3.09(12) FOR WIRING REQUIREMENTS.

Fig. 47—19-, 20-, 29-, or 30-Type Power Unit Connections Using a 92A Connecting Block

TABLE I

WIRING BETWEEN 92A CONNECTING BLOCK AND POWER UNIT

LEAD DESIGNATION	D INSIDE WIRING CABLE	451M OR 457M CABLE
A TALK	(W-BL) (BL-W)	(BL)
A GRD	(W-O) (O-W)	(BL-R)
B SIG	(W-G) (G-W)	(O)
B GRD	(W-BR) (BR-W)	(O-R)
10V AC	(W-S) (S-W)	(G)
ACG and MG	(R-BL) (BL-R)	(G-R)
LF	(R-O) (O-R)	(BR)
LW	(R-G) (G-R)	(BR-R)
105V RN	(R-BR) (BR-R)	(S)
10V RN	(R-S) (S-R)	(S-R)
105V 30 Hz	(BK-BL) (BL-BK)	(BL-W)
MS	(BK-0) (0-BK)	(BL-W-R)